Rafik Hariri University
جامعة رفيق الحريري

2023-2024 UNDERGRADUATE CATALOG

Affordable Excellence
In Education.

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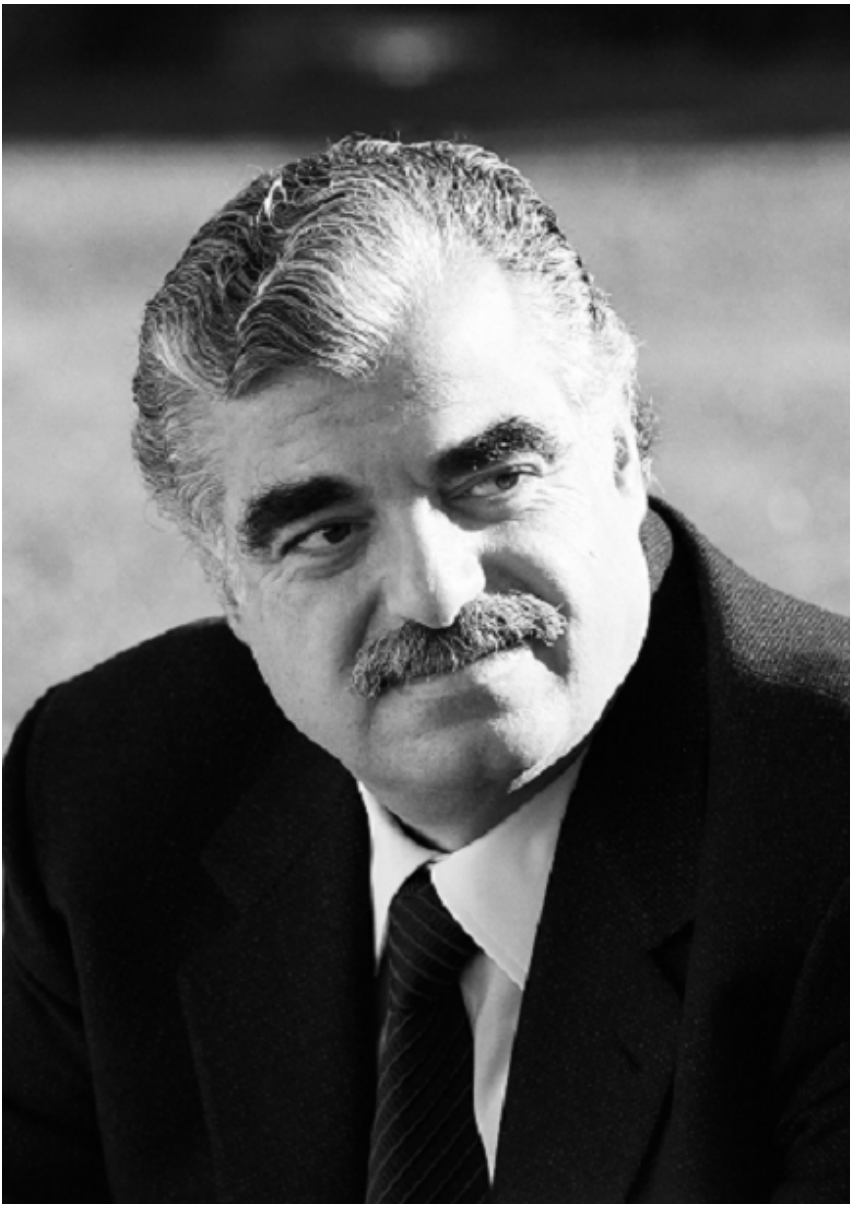

"إن أملي هو فتح أبواب الجامعات والمعاهد العليا أمام المواهب والكفاءات المغمورة"

Notice

The information in this catalog applies to the academic year 2023-2024 as of September 4, 2023. The University reserves the right to make changes in the programs, course offerings, academic requirements, and teaching staff as deemed to be in the best interest of students and without prior notice.

This catalog conforms to the related Lebanese laws and Directorate of Higher Education (DoHE) rules and regulations. In the event of a contradiction, the Lebanese laws and DoHE rules and regulations take precedence.

Student Responsibility for Catalog Information

Students are responsible for reading, understanding, and adhering to the information in this catalog. Failure to comply with the stated university, college, and program regulations will not exempt the students from the ramifications **or** penalties that could be incurred due to ignorance.

Contact Information

P.O. Box 10 Damour
Chouf 2010
Mechref, Lebanon
Telephone: (961) 5 603090
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E-mail: info@rhu.edu.lb

You can also view this catalog on the RHU website at https://www.rhu.edu.lb/academics/student-catalog.

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BOARD OF TRUSTEES

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Mr. Adib Bassatne

Prof. Hiam Loutfi, Interim President Rafik Hariri University

ACADEMIC CALENDAR 2023-2024

Fall Semester

Tue-Wed	Sep 5-6	Orientation and Registration / New Students Fall 2023
Mon -Tue	Jul 24 – Aug 1	Payment of Fall 2023 Tuition and Fees for Continuing Students
Mon	Sep 11	Classes Begin
Mon – Tue	Sep 18-19	Drop and Add Period
Thu	Sep 28	Prophet's Birthday/ Holiday*
Mon – Fri	Nov 13-17	Advising Week/ Spring 2024 for Continuing students
Wed	Nov 1	Founder's Day
Fri	Nov 17	Last Day to Withdraw from Courses
Mon – Fri	Nov 20-24	Registration Week/ Spring 2024 for Continuing student
Wed	Nov 22	Independence Day / Holiday
Wed – Thu	Nov 29 - 30	Orientation and Registration / New Students Spring 2024
Thu	Dec 7	Last Day of Classes
Fri	Dec 8	Reading Period
Mon – Fri	Dec 11-15	Final Examinations Period
Wed - Fri	Dec 20 – Jan 12	Payment of Spring 2024 Tuition and Fees
Mon	Dec 25	Christmas / Holiday
Mon	Jan 1	New Year / Holiday

Spring Semester

Sat	Jan 6	Armenian Christmas / Holiday
Mon	Jan 8	Classes Begin
Mon – Tue	Jan 15-16	Drop and Add Period
Fri	Feb 9	Saint Maroon's Day / Holiday
Wed	Feb 14	H.E.P.M. Rafik Al Hariri Commemoration Day
Mon – Fri	Mar 11-15	Advising Week / Summer–Fall 2024 for Continuing student
Fri	Mar 15	Last Day to Withdraw from Courses
Mon – Tue	Mar 18-26	Registration Week / Summer –Fall 2024 for Continuing student
Mon	Mar 25	Annunciation Day / Holiday
Fri – Mon	Mar 29 – Apr 1	Easter Latin / Holiday
Wed - Thu	Apr 10-11	Eid El Fitr/ Holiday
Wed	Apr 17	Last Day of Classes
Mon – Fri	Apr 22-26	Final Examinations Period
Wed	May 1	Labor's Day/ Holiday
Fri – Mon	May 3-6	Easter Greek Orthodox / Holiday
Mon - Tue	Apr 22 – May 21	Payment of Summer 2024 Tuition and Fees
Sat	Jun 1	Commencement Exercise (Tentative)

Summer Session

Mon	May 20	Classes and Co-op Work Experience Begin
Wed	May 22	Drop and Add Period
Mon - Tue	Jun 17-18	Eid El Adha/ Holiday*
Mon	Jun 27	Last Day to Withdraw from Courses / Co-op
Mon	July 8	Hijra New Year/ Holiday*
Thu	Jul 11	Classes and Co-op Work Experience End
Mon - Tue	Jul 15-16	Final Examinations Period
Wed	Jul 17	Ashoura Day / Holiday*
Thu	Aug 15	Assumption Day / Holiday

* Tentative dates pending moon sightings.

P.S. Any changes in public and religious holidays shall be reflected on our calendar in due time.

DIRECTORY

	Location	Extension
Acting Vice President for Academic Affairs	Block E	442
Vice President for Development and Information Technology	Block E	403
Vice President for Administration and Finance	Block E	403
Admissions Office	Block E	405/406/407
Bookstore	Block I	753
College of Business Administration	G 101 J	301
College of Engineering	C 103	501
College of Arts and Sciences	I 201	701
Communication and Alumni Relations	B 201	754/755
Dorm Supervisor	A 112	112
Finance Department	Block E	424/417-419
Graduate Studies and Research	Block B	611
Gymnasium	Block G	330
Health Clinic	I 119	751
Help Desk	Block G	333/334
Human Resources	Block E	787/786
Library	Block E	434/435
Media Center		754/755
Operator	Block E	0
President's Office	Block E	441/442
Purchasing and Procurement Department	I 111, I 112	743/744
Quality Assurance and Institutional Advancement	Block E	443
Registrar's Office	B 102	615/618
Security		290
Store	Block I	752
Student Affairs Office	Block E	770/777
Support Services Department	I 110	740/741

THE UNIVERSITY OVERVIEW

UNIVERSITY ADMINISTRATION

Hiam Loutfi, Interim President

Hiam Loutfi, Acting Vice President for Academic Affairs

Hisham Kobrosli, Vice President for Development and Information Technology

Ibrahim Akkawi, Vice President for Administration and Finance

Nidal Khalaf, Director of Administration

Board of Deans

Hiam Lotufi, Acting Vice President for Academic Affairs

Toufic Hijazi, Dean – College of Engineering

Jamil Hammoud, Dean – College of Business Administration

Mahmoud Halablab, Dean – College of Arts and Sciences

Admission

Zeina Tannir, Director

Communication and Alumni Relations

Rafal Tabbaa Khayat, Director

Finance Department

Sobhiya Doughaili, Associate Director

Human Resources Department

Doriah Naboulsi, Associate Director

Information Technology

Wassim Mallah, Associate Director of ERP Systems and Applications

Abdul Ghani Baba, Associate Director of Infrastructure and Security

Lina Basho, IT HelpDesk Support Manager

Library

Bassima Katerji, Circulation Librarian

Quality Assurance and Institutional Advancement

Mirna Talhouk, Associate Director

Registrar

Nidal Khalaf, Registrar

Student Affairs

Sahar Hallak, Assistant Director of Student Affairs

Campus Facilities

Ahmad Sabeh Ayoun, Director

THE UNIVERSITY

History

Establishing an educational institution that was financially and geographically accessible to all was a pressing dream for His Excellency Prime Minister Rafik Hariri. In the early 1980s, PM Hariri chose Kfarfalous, an area between the South, Bekaa, and the mountains, to be the place for establishing a hospital and a university in collaboration with the University of Saint Joseph. However, the 1982 Israeli invasion led to the destruction of the university and the theft of its equipment.

In 1984, the dream took a different turn with the establishment of the Rafik Hariri Foundation. It is a non-profit organization whose primary goal is to provide Lebanese youth with a chance for higher education in local and international universities. Around 33,000 Lebanese students benefited from the University Loan Program of the Rafik Hariri Foundation and pursued their education in Lebanon, Europe, North Africa, and North America.

After the end of the civil war in Lebanon, the Rafik Hariri Foundation decided to revive the dream of establishing an affordable and accessible university. The undertaking of such a massive project called for the help of experts from a country that had made significant strides in the field of education. Although several educationally advanced countries were considered, Canada was eventually chosen for this collaboration. The programs of study at Rafik Hariri University were developed in association with several Canadian institutions, including the Canadian Bureau of International Education, the Canadian International Development Agency, Capilano University, and Memorial University.

Rafik Hariri University opened its doors for the first time on September 15, 1999, with the College of Business Administration, following the Presidential Decree 1947. It began with an initial enrolment of 75 students. After the Colleges of Engineering and Science and Information Systems were established, RHU was granted university status on June 19, 2006, by Decree Number 17192.

Vision

RHU envisions becoming a beacon of knowledge, a brand for academic distinction, and a force of meaningful transformation. It strives to foster quality, institute authentic learning conditions, and support purposeful research to advance knowledge and nurture leaders capable of driving development and contributing to the enrichment of the community - immediate and beyond.

Mission

RHU shall: institute quality education by committing to due process, academic excellence, and distinction. It shall set up conditions conducive to farming dreams, stimulating imagination, and cultivating passion for lifelong learning. It shall instill the values of responsible behavior, tolerance, and freedom of self-expression and **thought,** and align learning outcomes with emergent community needs to transcend students' potential, possibilities, and contribution beyond time and distance.

Values

When it comes to values, RHU does not merely pay lip service. It is indeed deeply committed to several core values that it upholds and fulfills:

Shared Governance. Enable all RHU constituents to participate in shaping the provision of quality higher education.

Excellence. Offer a meaningful contribution to developing knowledge and promoting teaching excellence and administrative support.

Integrity. Operate with fairness, honesty, openness, and the highest ethical standards to sustain a community of trust.

Diversity and Tolerance. Create a community that advocates and promotes diversity and tolerance as a priority in academic and civic life.

Community Service. Show commitment to serving our community by responding to the needs and concerns of all stakeholders.

Purposeful Learning. Engage students in a learning experience congruent to individual aspirations and community needs.

Location

RHU enjoys a superb location atop a seaside mountain overlooking the Mediterranean Sea in Mechref; Damour, a short drive from Beirut, Saida, and Mount Lebanon in the heart of a prestigious gated community.

RHU campus is situated 20 kilometers south of Beirut. It spans an area of 54,000 square meters and comprises nine buildings. Seven of these buildings are used for educational purposes, while one building is used for the administration and one for faculty and student residences. The campus also features basketball and volleyball courts, parking areas, a long row of Washingtonian Palm trees, vegetable gardens, a greenhouse, and beautiful open green areas.

RHU began its vegetable gardens in the year 2021 and selected locations behind Block A - Dormitory Facility building and Block G - College of Business Administration. The landscaping team at RHU has leveled the ground fairly to prevent soil erosion and built a greenhouse for growing warm-season vegetables.

RHU's decision to grow crops is part of its sustainable campus initiative and its efforts towards caring for the environment. In addition to the aesthetic benefits, plants offer numerous advantages, such as carbon sequestration, oxygen production, flood reduction, and improved air quality. This also helps in reducing the impact of global warming.

RHU's electricity supply comes via three routes: Mains Electrical from EDL Grid, self-ran Diesel-oil Generators, and the daytime usage RHU Solar-PV plant. Currently, there is a 100 kW rated solar PV plant located on the top of three of RHU's buildings, Blocks F, G, and H.

Climate

The Mechref Village in Damour is a residential project that spans over altitudes ranging from 30 to 560 meters above sea level. The climate is moderately cold from December to March and hot from June to September. Although the classrooms are equipped with heaters and air conditioners, students are advised to wear warm clothing during the cold season.

The lush greenery of the RHU campus creates a refreshing atmosphere and provides further motivation for students to pursue their academic goals. The green lawns provide ample space for students to study, relax, or socialize. The mosaic of blue, green, and white – a blue sky, green lawns, and white buildings – of the RHU campus is itself magnificent.

Directions and Map

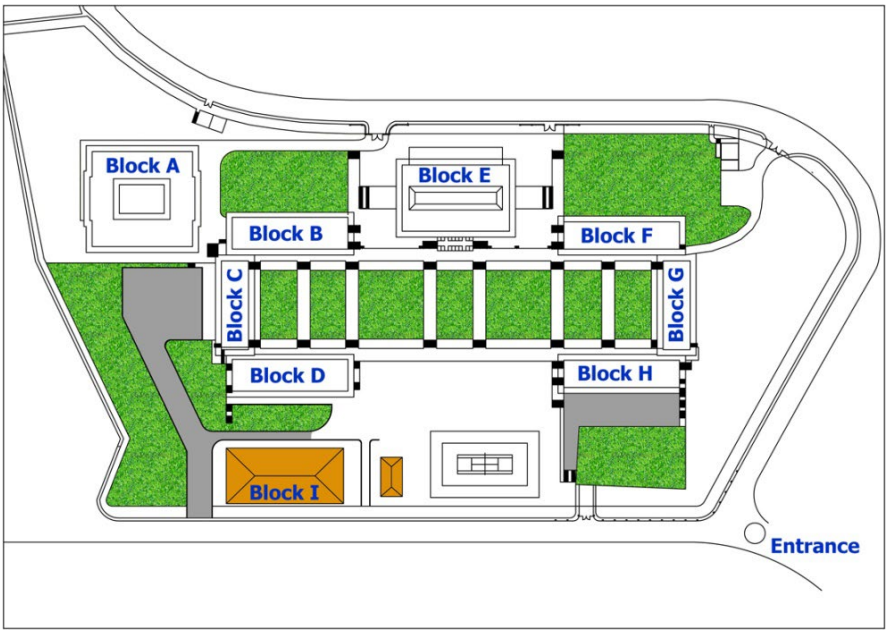
From Beirut

Take the Beirut Saida Highway south (towards Saida)
Take the Damour main exit (towards Deir Al-Qamar)
Go left on the roundabout (follow the Mechref Village road sign)
Drive for 300 meters
Take a right at the Mechref Village main gate
Follow the RHU signs leading to the Campus

From Saida

Take the Beirut Saida Highway north (towards Beirut)
Take the Damour main exit (towards Deir Al-Qamar)
Go left on the roundabout (follow the Mechref Village road sign)
Drive for 300 meters
Take a right at the Mechref Village main gate
Follow the RHU signs leading to the Campus

Map of the RHU Campus



ACADEMIC PROGRAMS AND DEGREES

RHU offers 20 accredited programs in 3 colleges of Business Administration, Engineering, and Arts and Sciences. The language of instruction is English. Below is a summary of the programs offered, degrees awarded, and the number of credits required to complete a degree. All programs include 30 credits of general education courses.

College/ Program	Degree	Credits
College of Arts and Sciences		
English Language (currently frozen)	BA	93
Computer Science	BS	94
Healthcare Information Systems	BS	100
Graphic Design	BS	111
Freshman Arts/Science		30
College of Business Administration		
Accounting	BBA	99
Business IT Management	BBA	99
Management	BBA	99
Human Resources Management	BBA	99
Marketing and Advertising	BBA	99
Finance and Banking	BBA	99
MBA – General Track	MBA	36
MBA – Oil and Gas Management	MBA	36
College of Engineering		
Civil Engineering	BS, BE, MS	114, 147, 48*
Biomedical Engineering	BS, BE, MS	114, 147, 48*
Computer and Communications Engineering	BS, BE, MS	114, 147, 48*
Electrical Engineering	BS, BE, MS	114, 147, 48*
Mechanical Engineering	BS, BE, MS	114, 147, 48*
Mechatronics Engineering	BS, BE, MS	114, 147, 48*

* 48 credits beyond the BS degree requirements for the thesis track option or 51 for the non-thesis track option

ADMISSION

Zeina Tannir, Director of the Admissions Office
Sawsan Sheikh Younes, Associate Director of the Admissions Office
Block E
Phone: 00 961 5 603090; Ext 405/406/407
E-mail: admissions@rhu.edu.lb
www.rhu.edu.lb/admission

The RHU Admissions Office manages all admission-related functions. The spectrum of responsibilities includes: managing admission applications; developing, maintaining, and implementing admissions policies and procedures; working closely with the academic units and University committees on admission issues; continuously engaging with prospective students by helping them complete their application dossier, responding to their inquiries and supporting them in making informative academic choices, and informing them of the admission decision and related stipulations; managing enrollment campaigns and meetings with school principals, parents and community leaders; preparing and updating admission materials; participating in the organization of students' open-day and orientation programs; and generating admission statistics and reports.

Applications for admission may be submitted via mail, email, online, or in person. Admission to RHU is competitive; Students with strong high school records may receive early admission to RHU. For details on admission requirements, application deadlines, procedures, and fees to various University programs, please refer to the Admission section in this catalog or visit www.rhu.edu.lb/admission

Undergraduate Admission

General Information

Rafik Hariri University admits academically qualified and morally sound students irrespective of origin, color, gender, religion, or disability. RHU notifies students of the decision to accept them or not within four weeks of receiving their complete application and supporting documents. Outstanding students may receive early admission to RHU based on their academic achievement in high school.

Fulfilling the following admission requirements does not guarantee admission to a program. These requirements represent a threshold for including the application in the competition pool. Admission is competitive and subject to the availability of spaces in the desired program.

The following stipulations pertain to admission to undergraduate programs. Admission requirements for graduate studies are in the Graduate Catalog.

Admission Requirements

Applicants to RHU must satisfy the following basic requirements: (1) attained the prerequisite education for the program of interest; (2) have not been expelled from another institution for academic or misconduct reasons; (3) completed and submitted the application form and all application materials to the Admissions Office by the stated deadlines and paid the application fee (4) submitted all required certified documents; and (5) provided photocopies of passport and residence permit (for non-Lebanese applicants).

Students may register for their courses after completing all RHU admission requirements.

Academic Preparation

To be admitted, the student must have completed at least 12 years of schooling before joining the University and provide proof of English language competency as detailed below.

Lebanese Baccalaureate. Students who hold a Lebanese High School Certificate may be admitted to a desired undergraduate program according to the requirements specified in the following table.

College	Baccalaureate Study Track
Arts and Sciences	General and Life Sciences, Sociology & Economics*, Humanities & Literature**
Business Administration	General and Life Sciences, Sociology & Economics, Humanities & Literature***,
Engineering	General and Life Sciences, Sociology & Economics*
* Sociology & Economics track students must take two remedial Math courses, as a prerequisite to joining Computer Science or HCIS offered by the College of Arts and Sciences or four remedial courses, two Math and two Physics, as a prerequisite to joining any program offered by the College of Engineering **Humanities and Literature track students can enroll in all majors offered by the College of Arts and Sciences except for Computer Science, HCIS, and Math majors. ***Humanities and Literature track students must take one remedial Math course as a prerequisite to joining the Business Administration program.	

Lebanese Technical Baccalaureate. Students who hold a Technical Baccalaureate Certificate may pursue a degree in a major that corresponds to the technical degree area of specialization as stipulated by the Lebanese Ministry of Higher Education Decree # 779/M/2013. The student must complete the remedial courses specified in the table below.

College	Majors	Course Category (# credits)
Arts and Sciences	• Computer Science • Healthcare Information Systems	• Mathematics (6 credits) • Physics (3 credits) Chemistry (3 credits)

Business Administration	All majors	• Mathematics (3 credits) • Statistics (3 credits) • Economics (3 credits)
Engineering	All majors	• Mathematics (6 credits) • Physics (6 credits) • Chemistry (3 credits)

Foreign Secondary Level Certificate. Holder of a foreign certificate that is equivalent to the Lebanese Official High School diploma, such as the Official Secondary Certificate from Arab Countries, French Baccalaureate, International Baccalaureate, and the German Abitur may enroll in an appropriate program provided that the certificate is validated by the Ministry of Education.

High School Diploma. A student who holds a High School Diploma (American system) may be admitted to the freshman program if the following conditions are met: (1) The student has completed 12 years of study; (2) the certificate is recognized by the public authorities in the country of origin; and (3) certified copy of the permission to join the Freshman Program from the Equivalence Committee of the Lebanese Ministry of Higher Education.

General Certificate of Education (GCE). An applicant with a British Certificate may be admitted to the freshman program if s/he has completed 5 Ordinary Level courses and one Advanced Level and has completed 12 years of study. Applicants with A-levels who have completed a minimum of three subjects at the Ordinary Level in addition to two subjects at the Advanced Level or four Advanced Supplementary subjects (AS) excluding languages can be admitted to the sophomore program.

Placement Exams

Students are required to provide evidence of English Language competency and college-level skills in key areas corresponding to the major they wish to pursue. This evidence may be in the form of submitting standardized test scores such as TOEFL, SAT, etc., or by taking the RHU placement exams as indicated in the table below. Depending on their performance, students may be required to take remedial courses to improve their competencies and prepare them for the rigor of related college-level courses.

College	Placement Exam
Arts and Sciences	• English
Business Administration*	• English
Engineering*	• English

English Language Proficiency Requirements

English is the language of instruction in all programs offered at RHU. Applicants must therefore demonstrate English language proficiency by passing the RHU English Entrance Exam or by achieving a minimum score on Standardized English competency exams as follows:

Standardized English Exam	Minimum Scores
Institutional TOEFL (ITP)/ RHU In-House TOEFL	550
Internet Based TOEFL (IBT)	80
IELTS	6.5
SATI: Writing and Language Section / Reading & Writing Evidence-Based	22 /530+

Students who fail to attain the requisite score will be required to enroll in the Intensive English Program (IELP) to achieve the necessary English proficiency. The IELP consists of three levels and the student is placed in the appropriate level based on the English proficiency examination score.

RHU recognizes an Institutional TOEFL score to be valid for one year from the date the test was taken. However, the IBT, SAT I, and IELTS scores are valid for two years.

When registering for TOEFL and SAT I, applicants must specify the RHU code 4438 for the results to be sent to the RHU Admissions Office.

Application Procedure

Prospective students may submit applications via one of the following methods.

Apply in person by visiting the Admissions Office:

Rafik Hariri University
Block E
Mechref Village
Damour- Lebanon

Apply online: https://www.rhu.edu.lb/prospective-students/online-application-forms

Required Documents

Applications for undergraduate admission must include the following officially certified documents:

1. Grades of the last three high school years submitted in a sealed and stamped envelope.
2. Certified copy of high school certificate or diploma: Lebanese Baccalaureate, Technical Baccalaureate, French Baccalaureate, IB Diploma; etc.
3. Certified copy of the Lebanese Baccalaureate equivalency for non-Lebanese degrees or diplomas. (French Baccalaureate; International Baccalaureate; etc.)
4. Scores of one of the English proficiency exams (see above).
5. Original or certified copy of personal civil status record (for Lebanese applicants) or photocopies of passport and residence permit (for non-Lebanese Applicants).
6. Three identical recent passport-size, colored photos.
7. A non-refundable application fee of USD 20 is paid in cash at the RHU Finance Office or any branch of BankMed.

Admission to the Freshman Program

In addition to the documents required for undergraduate admission to RHU, applicants to the freshman programs must also:

a. Provide a certified copy of Permission from the Equivalence Committee of the Lebanese Ministry of Education to join the Foreign Program/Freshman class
b. Submit the following scores in one of the below aptitude tests before they can enroll at RHU:

Aptitude Test	Freshman Arts	Freshman Sciences
SAT-Scholastic Aptitude Test	870	950
ACT - American College Test	15	17

Requirements of the Freshman Program Equivalency

1- **If your school is accredited by one of the following accrediting boards**, then the above requirements are enough to grant you admission to the sophomore year after you complete the Freshman Program and get the equivalency from the Lebanese Ministry of Higher Education

Accrediting Boards:
- Western Association of Schools and Colleges (WASC)
- Southern Association of Colleges and Schools (SACS)
- AdvancED (Cognia)
- New England Association of Schools and Colleges (NEASC)
- North Central Association of Schools and Colleges (NCASC)
- Northwest Association of Colleges and Schools (NACS)
- Council of International Schools

2- **If your school is not accredited by one of the above accrediting boards**, then you need in addition to the above two requirements (a & b) to submit ACT Subject Tests during your freshman year at RHU and before you can start your sophomore year.

Required subjects in the ACT Subject Tests exam are:
- Mathematics I and any other two subjects for Freshman Arts
- Mathematics II and two of the following subjects: Biology, Chemistry, and Physics for Freshman Science

Required scores in the ACT Subject Test:
- A minimum total score of 51 for Freshman Arts with a minimum score of 15 in each subject
- A minimum total score of 60 for Freshman Sciences with a minimum score of 17 in each subject

Please note the following:

Lebanese students will not be able to declare a major and join the sophomore class before satisfying the requirements set by the Lebanese Ministry of Education and Higher Education and the RHU freshman program.

Transfer Admission

A student enrolled in an accredited institution of higher education that requires full-time attendance may be admitted as a transfer student to RHU if space in the aspired program is available and the student meets the following conditions:

- Has studied at least one semester in the old institution; and has good academic standing
- Was not dismissed from the old institution for disciplinary reasons; and
- Satisfies the admission requirements of the desired program.

A transfer student is required to submit official transcripts attested by the Ministry of Higher Education in the country of origin and a certified copy of detailed descriptions of the courses taken at the previous institution. Students transferring from an institution outside of Lebanon must also submit a letter of accreditation from the Lebanese Ministry of Higher Education.

If later it is discovered that the transfer student had been dismissed from his/her former university for disciplinary reasons, his/her acceptance will be revoked retroactively.

The Admission Committee of the concerned College reviews the transfer applications and forwards its recommendations to the Dean who in turn informs the Director of Admission of the final decision for action.

A transfer student shall be treated as a new student regarding probation and dismissal rules. For transfer purposes, a regular semester is equivalent to a minimum of 12 earned credits. To earn a bachelor's degree, a transfer student must study at least three regular semesters at RHU for a three-year program or four regular semesters for a four-year program and acquire Co-op work experience.

Transfer Credits

Courses earned by a transfer student before joining RHU may count as RHU credits subject to the following conditions:

a. The credits were earned within three years of the effective transfer date.
b. The applicable course is deemed equivalent to the course offered at RHU, that is, at least 80% of its contents match, involves the same components (Lecture, Lab), and has the same number of credits or more.
c. The student has attained a minimum Cumulative GPA of 70% or its equivalent, then a grade of 75 or above on the course.
d. A transfer student accepted at RHU is required to complete a minimum of half of the credit requirements toward a bachelor’s degree

A “P” grade shall appear on the student's record for each transferred course but will not be included in the calculation of the cumulative GPA.

A student may decide to take a course at RHU for which equivalent course credits were transferred. In this case, either the transferred course or the RHU course and the associated grade shall appear on the student transcripts.

Non-Degree Admission

Visiting Student

Visiting student status allows students who are actively pursuing a degree at another college or university to take courses at Rafik Hariri University and transfer credits back to their home institution.

Prospective undergraduate visiting students must meet the following minimum admission requirements:

- Be in good academic standing (A minimum CGPA of 70% or its equivalent) from a university recognized and approved by RHU.
- Demonstrate English Language Proficiency:
  TOEFL-IBT minimum 65 or above
  IELTS minimum 5.5-6 or above
  RHU in-house TOEFL minimum score 514

The above requirement may be waived for applicants coming from institutions where the language of instruction is English.

Required Documents:

1. Fill and submit a relevant application form (a non-refundable application fee applies)
2. Provide an official college/university transcript.
3. Submit written permission from the home institution for the courses to be taken at RHU.
4. Three passport-size photos and a copy of the ID.
5. A non-refundable reservation deposit which fully applies towards tuition to be paid upon acceptance.

Non-degree Student

Students who have a recognized secondary school diploma or a university degree and are interested in taking specific courses to enhance their professional growth and skills can join RHU for academic credit.

Prospective undergraduate non-degree-seeking students must meet the following minimum admission requirements:

- Students must have a high school leaving certificate or higher level of education recognized by RHU.
- Demonstrate English Language Proficiency:

TOEFL-IBT minimum 65 or above
IELTS minimum 5.5-6 or above
RHU in-house TOEFL minimum score 514

The above requirement may be waived for applicants coming from institutions of higher education where the language of instruction is English.

Required Documents:

1. Fill and submit a relevant application form (A non-refundable application fee applies)
2. Provide an official high school leaving certificate or college/university transcript and a copy of the degree/diploma.
3. Three passport-size photos and a copy of the ID.
4. A non-refundable Reservation Deposit which fully applies towards tuition to be paid upon acceptance.

Admission to RHU as a visiting or non-degree student doesn't guarantee admission to any of RHU's regular degree programs. Credits taken at RHU may be considered toward an RHU degree if the student re-applies for admission as a regular student and is accepted based on the admission criteria.

Auditors

Individuals wishing to attend classes without receiving academic credit can join RHU as auditing students.

Auditors should submit the relevant application form, a non-refundable application fee, a passport-size photo, a copy of ID, and a non-refundable reservation deposit that applies towards tuition.

Part-Time Students

Students may wish to pursue a degree at RHU on a part-time basis, taking less than the full load of 12 credits per semester. This option is possible provided that the maximum duration for receiving a degree is not exceeded. Accordingly, students may be required to enroll on a full-time basis for a few semesters to complete their degrees within the sanctioned period.

Admission to Graduate Studies

Admission to any graduate program at RHU is based on merit. It is offered to applicants holding undergraduate degrees from RHU or other accredited institutions. Students can apply to graduate studies for the fall or spring semesters. Applications are available at the Admissions Office or may be downloaded from RHU's website: www.rhu.edu.lb. For details on graduate study programs and related regulations please refer to the Graduate Catalog.

Fees and Expenses

Tuition Fees

The University tuition and fees are determined by the Board of Trustees on an annual basis. Tuition and fees may increase annually without prior notice. Currently, tuition and fees are posted on the University website: www.rhu.edu.lb.

Tuition	LBP	USD
College of Business Administration		
Undergraduate Program		
Per credit	1,890,000	$126
Graduate Program		
Per credit	4,347,000	$299
College of Engineering		
Undergraduate Program		
Per credit	2,772,000	$189
Graduate Program		
Per credit	4,347,000	$299
College of Arts and Sciences		
Undergraduate Program		
Graphic Design (*per credit*)	2,079,000	$142
Computer science; Health Care Info. Sys. (*per credit*)	2,079,000	$142
Other Programs		
Freshman Level Courses		
Per credit	2,095,000	$142
Intensive English Language Program (IELP)		
IELP 070	5,749,000	$450
IELP 085, IELP 095	5,749,000	$158
IELP 100	3,260,000	$110
Fees		
Enrollment [1]	3,000,000	**$100**
Deposit [2]		**$100**
NSSF [3]		
Service Fees [4]		
Per semester		**$165**
Per summer session		**$75**
Deferred Payment [5]		
Per semester	500,000	
Per summer session		
COOP		**$100**
Late Registration		$20
Late Payment[6]		
On USD installment		$20
On each LBP installment	1,000,000	

Transportation / Parking (Optional)		
Regular Shuttle [7]		
Per semester		$300
Per summer session		
Parking Fee		
Per semester		$50
Per summer session		$25
Dormitory/Housing (Optional)		
Double room in a shared apartment- fall or spring semesters (Block- A)		**$600**
Double room in a shared apartment- summer semester (Block A)		**$300**
Single room -fall or spring semesters (Block A & F - cat. I)		**$750**
Single room - summer semester (Block A & F- cat I)		**$300**
Single room -fall or spring semester (F - cat. II)		**$800**
Single room - summer semester (F - cat. II)		**$400**
Dorm Deposit [8]		**$100**

*Enrollment fees: Non-refundable fee assessed to new students upon the decision to join RHU and would be credited to the tuition fees.
**Deposit fees: A fee assessed to new students upon the decision to join RHU and is refundable only upon graduation
***Deferred Payment: Payments of tuition fees will be scheduled over:
1- Four installments for Fall and Spring semesters:
- The first and second installments cover the dollar part.
- The remaining two installments cover the Lebanese part.

2- Two installments for a summer semester
- The first installment covers the dollar part.
- The second installment covers the Lebanese part.

****Late registration: A student is required to register during the registration period otherwise a late registration fee of 20$. will be added.
*****Late payment: A late payment charge of 20 USD. shall be charged for USD installments not paid by the established deadline.
*****Late payment: A late payment charge of 1,000,000 L.L. shall be charged for any installment not paid by the established deadline
******Transportation fees: Transportation fees are not refundable

Other Notes:

1- Students with financial holds will not have access to their grades and will not be able to register during the normal registration period.
2- Students with outstanding financial holds are not eligible to get any official document from the university unless the holds are cleared.

Payment Methods

Students are required to pay all tuition balance and other university fees by the announced deadlines to avoid late payment fees and the risk of courses being dropped. Once the student registers for a course, he/she shall remain accountable for all

applicable tuitions and fees until he/she drops the course formally by the drop/add deadline. Refer to the academic calendar at www.rhu.edu.lb for applicable deadlines.

Payments must be made in cash by the announced deadlines through one of the following methods:

1. At any branch of BankMed
2. RHU Finance Department

Each student is required to download his/her statement of fees from RHU's Student Information System (SIS), print it, and present it to the Bank/Finance Department at the time of payment.

All student payments will be automatically deferred over four payments for the fall and spring semesters and over two payments for the summer semester.

Tuition Refund

In case any student decides to drop an **already** paid course (s), the following will be applied:

1. During the drop and add period, paid fees of the dropped course(s) will be credited to the student's statement of fees in full.
2. After the drop and add period, no refund will be applied, unless the student withdraws due to emergent circumstances.
   Refer to the withdrawal section of the catalog for more information.

If a student decides to officially withdraw from the University, then the following will be applied:

1. If a student had paid the full tuition and fees:
   - Before the official beginning of classes, 75% of the tuition and fees are refunded.
   - On the first day of classes and during the Drop and Add period, 50% of the tuition and fees are refunded.
   - After the Drop and Add Period, no refunds.
2. If a student is benefiting from the deferred payment program, no refund of tuition and fees is applicable.

Clearance and General Deposit Refund

Upon completion of the graduation requirements, the student must fill out a clearance form which can be obtained from the registrar's office. Upon filling out the form and securing the required signatures the general deposit can be refunded.

The dorm deposit is refundable upon graduation and leaving the dormitory facility.
P.S. All deposits will be refunded after deducting any outstanding balances.

LIBRARY

Block E
Phone: 00961 5 603090; Ext: 434/435
E-mail: library@rhu.edu.lb
www.rhu.edu.lb/library

The Library at Rafik Hariri University supports students, faculty, and staff with the resources and services they need to succeed in their educational and research undertakings. The library was founded in 1999, Its building occupies more than 650 square meters of space offering the users ample study and computing commons, halls for meetings, seminars, conferences, and classrooms. The library applies international standards and implements modern technologies in all functions and services. RHU library provides resources to academic programs in the form of books, journals, and multimedia resources. It also has a modern IT infrastructure which includes:

- An integrated library system (MEDAD ILS system) that embeds all library functions, services, and auxiliary tools that can be accessed at and off campus.
- Workstations located in the references area and connected to the Internet to access online catalogs, e-databases, Turnitin, and other resources
- A Multi-media room equipped with state-of-the-art modern tools, computers, video projectors, data shows, CD writers, scanners, etc.
- Wireless connectivity covers all library spaces.

RHU continues to develop branding and library resources and services in response to changes and emergent needs, participate proactively in the enrichment of the educational experience, improve information technology and multimedia assets, repurpose available space to accommodate changing library roles, improve community outreach and branding, and improve administrative structure and commit to due process.

Information Resources

Collections available at RHU Library include a wide range of information resources to support all academic disciplines and meet the needs of university faculty and students. In addition to maintaining traditional printed resources in the form of books and periodicals, the library holds a collection of electronic resources and multimedia materials (ProQuest & Springer Databases). The library home page provides links to full-text online databases, e-journals, e-books, research databases, and online catalogs. The homepage also includes information about library policies, service hours, auxiliary tools, and services. See https://rhu.edu.lb/Library.

Organization of Materials

Library resources are organized following international standards and best practices. All print resources are arranged and cataloged according to Dewey Decimal Classification 21 and MARC21 formats and standards which are used to build bibliographic databases.

Library Services

The library staff assists users in using library resources and responds to inquiries received in person, by phone, by email, or through the library home page electronic forms. The staff also organizes specific training sessions to help users improve their skills in searching and retrieving relevant information. Faculty, students, and staff holding valid ID cards may borrow library materials in accordance with the circulation policy. Faculty members may request books and other materials on reserve for use by students inside the library premises for some time. Computer commons allow users on-site access and retrieval of resources. Media resources, copiers, and printers are available for use inside the RHU Library. Pre-paid cards may be purchased to use the printing and photocopying machines.

Also, to expand resources beyond what is available on campus, improve services provided, and support research, the RHU Library joined the Interlibrary Loan Consortium and signed an agreement with Baakline National Library. These agreements will facilitate the sharing of resources between libraries by supplying books, e-book chapters, articles, and other material.

Interlibrary Loan

RHU students can borrow free of charge books, documents, and articles that are available in the libraries of the American University of Beirut, Beirut Arab University, Haigazian University, Lebanese American University, Middle East University, Notre Dame University-Louaize, United Nations - Economic and Social Commission for Western Asia, Université Saint-Esprit de Kaslik, Kaslik, Université Saint-Joseph de Beyrouth, and University of Balamand.

Baakline National Library

RHU students can visit and borrow free of charge books, documents, and articles available in the Baakline National Library.

Library Clearance

To obtain library clearance, all graduates are expected to submit a soft copy of their senior projects; according to RHU Library format (Turabian format); Graduates should also make sure that all books and other borrowed materials are returned to the library before the clearance.

INFORMATION TECHNOLOGY DEPARTMENT

IT Helpdesk
Phone: 00961 5 603090 Ext: 333
E-mail: helpdesk@rhu.edu.lb
www.rhu.edu.lb

The Information Technology Department exists to provide optimal IT solutions to support the University students, faculty, and staff in their quest to achieve excellence in teaching, learning, research, and service. It actively engages the teaching and learning processes by introducing multimedia solutions and mobile technologies, creating a smart classroom environment, and supporting effective utilization of the learning management system.
The IT Department also supports the administrative divisions in adopting technologies that improve users' productivity in executing University functions and managing all University information systems. Additionally, the IT Department maintains and upgrades all hardware, software, and applications dedicated to running University academic and administrative functions. The IT Department also engages in infrastructure planning and maintenance and supervises related projects.

Operation and Network Services

The IT Department runs a state-of-the-art Data Center that houses the computers and related telecommunications and storage systems, including latest-generation servers, Virtual Desktop Infrastructure, Storage Area Networking, and Intrusion Prevention System. The center operates redundant power sources, redundant data communications connections, and security devices.
The center includes numerous servers that provide all students, faculty, and staff the storage space and privileged access to network-based data, software resources, and Internet and e-mail services.
The network serves all students, faculty, and staff. It covers over nine buildings of classrooms, offices, and student and faculty dorms. The Gigabit Ethernet fiber-optic backbone network is connected to the Internet through a 150 Mb/s line to provide the necessary bandwidth for quality services. The network consists of over 840 voice/data points and 40 or more wireless access points covering all university buildings. At present, nearly 400 computers make up the University network.

Management Information System (MIS)

The Management Information Systems (MIS) Section includes a highly competent team that manages the University Information Systems. The MIS is responsible for developing, administrating, supporting, and providing service management for the University Enterprise Resource Planning (ERP), including the Student Information System (CampusVue), student accounting, finance, payroll, human resources systems, library and archiving systems, staff work log system, and an ID card system. Furthermore, the

MIS manages information flow and generates reports to various University divisions for planning and decision-making purposes.

University Website

RHU website is an essential communication tool for the University and the source of vital information for prospective and current students, faculty, and staff, among other audiences.
Management of the website through a responsive content management system (CMS), led by the system administrator, strives to ensure that all the information is accurate and easily accessible.
The website provides the users with all available online services, including a Student Information System, Moodle, an Online Payment System, Surveys and Voting, an Alumni Section, the latest Press Releases, Events and News, Careers, Downloadable Applications, and much more.

Instructional and Classroom Technologies

A team of dedicated specialists provides technology-aided teaching that meets the learning needs of faculty and students. It maintains the multimedia assets in more than 32 classrooms and smart classrooms. The team manages Moodle – a Learning Management System (LMS) - which provides the platform through which faculty and students actively engage in the course material and improve students' potential to attain expected learning outcomes. New tools simplify the creation of online courses and enable the conversion of documents into dynamic objects.

IT Helpdesk Support Services

The IT Helpdesk team provides a wide range of support services for the students, faculty, and staff at RHU to ensure that technology-aided teaching, learning, and administrative processes are running smoothly. These services include but are not limited to supporting all the IT peripherals (hardware and software) in offices, classrooms, and computer labs, users' accounts management, e-mail services, internet, and Wi-Fi services, file sharing management, surveillance cameras management, access control management, ID cards printing, etc.

The Helpdesk team utilizes the Ticket Management System "TMS" as the primary communication channel with RHU faculty and staff members. TMS provides a transparent and interactive platform for staff and faculty members to send and save requests (tickets) to report incidents and follow up on them. Also, TMS provides a space for end-users to provide satisfaction feedback on the service they receive from the ITC personnel in each ticket.

QUALITY ASSURANCE AND INSTITUTIONAL ADVANCEMENT

Ms. Mirna Talhouk, Associate Director
Block E
Phone: 00961 5 603090, Ext. 443
E-mail: qaia@rhu.edu.lb
www.rhu.edu.lb/qaia

The Quality Assurance and Institutional Advancement (QAIA) unit was established in 2014 to collect and analyze vital institutional data and to develop and implement quality assurance policies and procedures. The unit aims to improve institutional effectiveness, facilitate continuous improvement, support shared decision-making, and ensure the attainment of aspired excellence in all areas of the university. The QAIA unit is responsible for the following duties:

- Act as a repository of all official institutional documents and statistics;
- Design surveys, focus groups, assessment tools to collect and analyze institutional data;
- Issue reports to the University administrators;
- Maintain a database about competitor institutions;
- Prepare and maintain the University portfolio of programs by developing and implementing an institutional database for Rafik Hariri University that will integrate data from all sources of information in all colleges of the university;
- Harmonize the institutional effectiveness activities to ensure that all academic and administrative units achieve their outcomes and ensure consistency in all campus locations;
- Identify gaps in data collection, analysis, and utilization and establish procedures to maintain the quality of data;
- Ensure proper use of knowledge and internal/external assessment data;
- Design and update the evaluation and assessment methods appropriate for each category of programs and verify all development plans;
- Support academic units in accreditation efforts;
- Conduct periodic audits to monitor performance and improve related practices.

STUDENT AFFAIRS

Mrs. Sahar Hallak, Assistant Director
Block E
00961 3 5603090 Ext. 770/777
studentaffairs@rhu.edu.lb
www.rhu.edu.lb/studentaffairs

The Student Affairs Office is responsible for many functions that serve to support the nonacademic aspects of university life that improve students' potential for academic success and help them attain a meaningful holistic experience. The Office manages student clubs, promotes athletic and creative activities, organizes cultural events, oversees housing facilities, provides counseling services, holds student elections, and organizes student orientation programs, in addition to handling the Work Study and the Financial Aid Programs. A brief overview of the various functions and services is presented in the following.

Cultural, Social, and Artistic Activities

RHU provides a supportive environment that encourages and enables students to actively participate in extracurricular activities. The Student Affairs Office works closely with student clubs, societies, and councils to enrich students' life outside the classroom. By organizing a wide spectrum of athletic, cultural, social, artistic, and theatrical activities and events that are physically, psychologically, and socially constructive, students can advance a cause and practice a hobby they are passionate about. In doing so, students can connect with like-minded peers, build friendships, and develop leadership skills.

Counseling and Coaching

The Student Affairs Office aims to create conditions that promote students' social and psychological comfort essentials to achieve academic success. The Student Affairs Office supports students in overcoming obstacles and challenges they encounter during their university experience. The office organizes seminars and workshops to promote student awareness and help them develop skills in coping with social, psychological, and emotional difficulties and challenges. The office also provides one-to-one counseling to help a student deal with personal issues and anxieties and make appropriate choices and decisions. For more information, please contact the Student Affairs Office at: studentaffairs@rhu.edu.lb or 05/603090, Ext: 777.

Student Representations

We at RHU strongly believe in the participation of students in the decision-making process about issues that matter to them. The Student Representative Committee (SRC)

was established to guarantee that the students' voices, opinions, and concerns are debated to influence the outcomes of related decisions. Elections are held annually in which students choose their representatives on the SRC transparently and democratically.

Student Housing

There are two separate dormitories at Rafik Hariri University, one for the female students and the other for the male students.

The employees working in the students' dormitory yearn to offer comfortable, safe housing experiences to international students and dorm residents who study away from home. Each dorm features a social sit-in area, a study room with computers connected to the internet and library resources, and broadband WiFi coverage.

The University is keen to make the living experience on campus an opportunity to strengthen ties and build lifelong friendships among all students. The Student Affairs Office organizes sports, cultural, and social events exclusively for students living on campus. For more information on housing services please contact us at studentaffairs@rhu.edu.lb or 05/603090, Ext: 777.

Athletics and Recreation

The indoor sports center and outdoor tennis, football, and basketball courts at RHU provide ample opportunities for students, faculty, and staff to participate in their favorite sports, hobbies, and training needs. A team of specialists organizes athletic activities and tournaments to engage students and help them develop skills in the sports they are passionate about. Varsity teams are formed and supported to participate in local and international competitions. For more information, please contact the Athletic Department on 05/603090, Ext: 330.

Ushers

This program trains student volunteers and involves them in organizing university-sponsored events and conferences, on and off campus. Ushers play a vital role in the success of the open-house activities, graduation ceremony, and new-students orientation. Ushers are trained to guide students, parents, and guests and make them feel at ease during their visit to the campus. For information contact us at studentaffairs@rhu.edu.lb or 05/603090; Ext: 777.

Transportation

There are free bus shuttles that transport students from the dormitory to Damour's highway. Shuttle bus services are available to transport students to the RHU campus from and to several areas in Lebanon.

The buses run the routes several times per day. For more information about the bus schedule, please contact the Student Affairs Office studentaffairs@rhu.edu.lb or 05/603090, Ext: 777.

Student Centers

There are student lounges to relax and enjoy activities such as pool, chess, ping pong, and other entertainment. Each dorm also has two common rooms, one for social gatherings and the other for studies.

Food Services

The cafeteria at Rafik Hariri University serves a variety of traditional and international cuisines at reasonable prices during the day and through the evening hours. RHU also has ample and comfortable seat-in areas to enjoy your meal in the picturesque natural outdoors.

Health Care

The University Medical Clinic has a resident nurse who provides RHU students, faculty, and staff preliminary healthcare services around the clock. The clinic is in Block "I" next to the bookstore. Ambulance services are also available around the clock in case a situation needs attention beyond the clinic's available resources.

Student Rights and Responsibilities

Rafik Hariri University (RHU) pledges to students ***the right to***:

- be challenged to enrich the capacity for critical judgment;
- receive support in pursuit of answers and meanings;
- study in an inspiring and supportive learning environment;
- receive proper academic advising and mentoring;
- be treated with dignity and respect by all;
- receive a clear and informative course outline at the start of the semester and be informed of any modifications thereafter;
- receive constructive feedback on coursework within a reasonable timeframe;
- be assessed on the merits of academic performance without prejudice or other discrimination;

- ensure the confidentiality of academic and personal information;
- access all information and documents;
- express an opinion and convey grievances without fear of retribution; and
- protest the violation of rights, appeal judgment deemed unfair and receive and understand related decisions;

And expects students to accept ***the responsibility to***:

- understand, comply and safeguard the University by laws and student code of conduct;
- set a purpose and drive to achieve it;
- study hard to learn and commit to forever learning;
- know the program study plan and graduation requirements;
- follow course outline, attend all classes, and accomplish course requirements timely and honorably;
- respect and adhere to established University deadlines;
- be courteous, respectful of diversity, and tolerant of others' beliefs and concerns;
- express concerns and grievances within the confines of civility;
- follow due process and react with reason in the face of conflict;
- protect University property and preserve campus beauty;
- embrace sustainable practices and use natural resources wisely; and
- represent the University with honor and professionalism.

Expected Conduct

Students are expected to behave morally, act responsibly, and work diligently to advance their lives and that of their communities. In doing so they will:

1. Work hard and intently engage in the educational experience.
2. Speak out respectfully and feel free to propose initiatives to improve the university experience.
3. Refrain from smoking except in designated spaces.
4. Help maintain the cleanliness and beauty of the premises.
5. Place trash and recyclable items in designated receptacles.
6. Protect University facilities that are built for their benefit.
7. Never cheat or claim credit for work that is not their own.
8. Respect diversity and be tolerant of all points of view that are different from their own.
9. Understand the rights and responsibilities and appreciate the premise on which they are founded.
10. Adhere to the university bylaws and policies and assist in implementing them.

Work Study Program

The University provides students with the opportunity to partially support them by working up to 8 hours per week. In addition to earning a modest income, the Work Study (WS) program helps students gain work experience, improve communication skills, and increase future job prospects. For more information, please contact the Office of Student Affairs at studentaffairs@rhu.edu.lb or call 05/603090, Ext: 777.

Financial Aid Program

RHU believes that every student should get the full opportunity to continue his/her education no matter how hard their living conditions are. For that, RHU offers financial assistance to qualified students who cannot afford the cost of their tuition. For inquiries about this program, please contact the Student Affairs Office at studentaffairs@rhu.edu.lb or call 05/603090, Ext: 777.

REGISTRAR'S OFFICE

Nidal Khalaf, Registrar
Amani Baasiri, Associate Registrar
Block B, Room 102.
Phone: 00961 5 60390, Ext: 615/618.
Email: registrar@rhu.edu.lb
www.rhu.edu.lb/registrar

The Registrar's Office administers academic processes, enforces academic regulations, and tracks students' academic progress. The office coordinates closely with academic advisors and academic units to guarantee the accomplishment of the following responsibilities: implementing updated study plans; maintaining student's academic records; enforcing University academic regulations, policies, and bylaws; tracking students' performance and generating students' statistical reports; preparing courses and exams schedules; assigning classrooms; registering students for the correct classes; issuing transcripts; verifying graduation lists; ensuring up-to-date CampusVue records and information; and updating and publishing University calendar and catalog.

The Registrar's Office uses the CampusVue Students Information System to implement academic processes and maintain students' records in coordination with the MIS team at the IT Center. Students and faculty have CampusVue personal secured accounts to access relevant records, courses, schedules, grades, etc.

For registration procedures, deadlines, and related issues please refer to the Registration section in this catalog or visit: www.rhu.edu.lb/registrar

Registration

Students, after consulting with their academic advisors, must register for the courses they intend to take during the registration period noted in the academic calendar, presented in this catalog, and posted on the University website www.rhu.edu.lb/. During the registration period, academic advisors assist the students in preparing the course schedules by completing the Course Registration Forms and activating personal online CampusVue registration. Copies of the Course Registration Forms must be sent to the Registrar's Office after the drop/add period for verification of students' schedules and archiving. Any course registered online by the student without prior approval of the academic advisor shall be automatically dropped.

The course schedule must comply with the following rules: the prerequisite(s) of the courses the student intends to take were completed, the courses are required by the program and are taken in the order noted in the program's study plan, failed courses are taken when first offered, and the maximum and minimum load rules are met. After completing the registration, the student must print the statement of fees and proceed to pay all applicable tuition and fees by the announced deadlines. Failure to meet financial commitments may result in dropping the class schedule.

National Social Security Fund (NSSF)

The Lebanese Law mandates that all Lebanese students be registered as members of the NSSF. This requirement does not apply to non-Lebanese students. A Lebanese student admitted to RHU must complete the Social Security Application form that is dispatched with the admission letter. On the form, the student indicates:

- NSSF status (beneficiary or not)
- NSSF number if already registered (employed students only)
- NSSF number of parents (if beneficiary)
- An official attestation of the type and source of all benefits including NSSF.

Refer to the Student Services section for more information on NSSF matters.

Passport and Visa

Expat students admitted to RHU must have their passports valid for 13 months from the date they join RHU and must obtain a visa from the Lebanese Embassy in the country of origin.

ACADEMIC REGULATIONS

The following section presents the academic regulations applied to bachelor's degree programs. These regulations are meant to assist students, academic advisors, administrators, and staff in making appropriate decisions. The President, Vice Presidents, Deans, and the Registrar's Office shall be responsible for their implementation. The University Academic Board is authorized to rule on cases that are not covered in these regulations and to mitigate problems arising from their application.

Pleading ignorance of these regulations or related publications and announcements posted on catalog boards in various campus buildings shall not exonerate students from the consequences of their violation.

Student petitions to circumvent academic rules must be verified by the academic advisor for the authenticity of the information before it is forwarded to the responsible entity for further action.

Duration of Study

Minimum Period

To earn a Bachelor's degree, a student has to study a minimum period as a matriculated student at the RHU as indicated in the table below.

Minimum duration to earn a Bachelor's degree		
College of Arts and Sciences	Bachelor of Arts Bachelor of Science Bachelor of Fine Arts	3 years
College of Business Administration	Bachelor of Business Administration	3 years
College of Engineering	Bachelor of Science	4 years (equivalent to 3 years plus 3 summer semesters)
	Bachelor of Engineering	5 years (equivalent to 4 years plus 3 summer semesters)

For transfer purposes, a regular semester is equivalent to a minimum of 12 earned credits. To earn a bachelor's degree, a transfer student must study at least three regular semesters at RHU (taking a minimum of 36 credits) for a three-year program or four regular semesters (taking a minimum of 48 credits) for a four-year program and acquire the Co-op work experience.

Maximum Period

The maximum study period to earn a bachelor's degree, excluding semesters of approved deferment of study, is 10 regular semesters for the Bachelor of Science, Bachelor of Arts, and Bachelor of Business Administration degrees and 12 regular semesters for the Bachelor of Engineering degree.

If, for compelling reasons, a student cannot complete the bachelor's degree within the apportioned period, a request for extension may be submitted through the college council for approval by the University Academic Board.

Student Class Level

The student class level is defined by the following criteria:

First year:	00-29 credit hours
Second year:	30-65 credit hours
Third year:	66-99 credit hours
Fourth year:	100 and above credit hours

Course Load

Minimum Load

The minimum semester load shall be 12 credits unless the student needs less than that to graduate. In certain cases, the College Dean may approve 9 credits minimum upon the recommendation of the Academic Advisor.

Maximum Load

The maximum load in a regular semester shall be 18 credits, which may be increased to 19 upon the Dean's approval. A student may be allowed to take a maximum of 21 credit hours if s/he: (1) has a CGPA of no less than 85 (2) needs 21 credits to graduate, and has a CGPA of 73 or above.

The maximum load in a summer semester shall not exceed 9 credits. A 10-credit load may be allowed if the student: (1) has a CGPA no less than 85 or (2) needs 10 credits to graduate and has a CGPA of 73 or above, or (3) the schedule includes a one-credit85 or lab course.

The maximum load for a freshman student is 15 credits in the fall or spring semesters and 9 credits in the summer semester.

Intensive English Program (IEP) Students

In addition to the English courses, students in the IEP may take courses required by the intended program of study as listed below.

IELP 085	IELP 095	IELP 100
A maximum of 10 Credits	A maximum of 10 Credits	A maximum of 13 Credits
College of Business Administration		
BITM 200; or MATH 189 or MATH 207; BADM 225; and ARAB 212	BITM 200; or MATH 189 or MATH 207; BADM 225; and ARAB 212	BITM 200; or MATH 189 or MATH 207; BADM 225; BACC 205; BADM 250; ARAB 212; and CMNS 200
College of Engineering		
MATH 190 or MATH 211; PHYS190 or PHYS 211; and CIVE 211 or CCEE 221	MATH 190 or MATH 211; PHYS190 or PHYS 211; and CIVE 211 or CCEE 221	MATH 190 or MATH 211; PHYS190 or PHYS 211; CIVE 211 and/or CCEE 221; and CCEE 214
College of Arts and Sciences		
COSC: MATH 190 or MATH 210; COSC 214; and Sciences / Technology elective **GRDS:** GRDS 220; FADR 220; and FADR 200 **LLA majors:** ARAB 212 and any two College required courses	**COSC:** MATH 190 or MATH 210; COSC 214; and Sciences / Technology elective **GRDS:** GRDS 220; FADR 220; and FADR 200 **LLA majors:** ARAB 212 and any two College required courses	**COSC:** MATH 190 or MATH 210; COSC 214; Sciences/ Technology Elective; and BMKA 200 **GRDS:** GRDS 220; FADR 220; FADR 200; and FADR 215 **EDUC:** EDUC 222; EDUC 200; one Social Science; and one Humanities elective **ENGL:** EDUC 222; PSYC 301; and any two College required courses **JRSM:** Humanities and Social Sciences electives
Freshman Program		
Arts: MATH 189; ARAB 180; Natural Science Elective **Science**: MATH 190, PHYS 190, ARAB 180 or Natural Science	**Arts**: MATH 189; ARAB 180; Natural Science Elective **Science**: MATH 190, PHYS 190, ARAB 180 or Natural Science	**Arts**: MATH 189; ARAB 180; Natural Science Elective; and Social Science Elective **Science**: MATH 190, PHYS 190, ARAB 180 or Natural Science; Social Science Elective

Schedule Modification

The student may modify the course schedule after registration by adding and/or dropping courses during the official drop and add period noted in the academic calendar. The student completes the Schedule Modifications Form, attains the approval of the academic advisor and the department chairperson, and settles consequential financial

obligations immediately after completing the transaction on the RHUSIS. If the course modification results in a load of less than 12 credits or more than 18 credits, approval of the Dean is also required.

Dropping Courses

Students who do not plan to continue in a course must drop it during the drop/add period otherwise the student remains financially accountable for the course. A course dropped during the official drop and add period will be deleted from the student's schedule and the student will be relieved from the financial liability associated with the deleted course. If a refund is due, the provisions of the refund policy will apply.

Adding Courses

A student may add one or more courses to his/her schedule during the drop/add period. The student must settle the financial obligations due to the course(s) addition by the prescribed deadlines.

Late Registration

Students who could not register during the normal registration period may register during the drop/add period and pay a late registration fee. The fee may be waived for new students or for students who could not register earlier due to urgent circumstances.

Repeating Courses

The student must repeat all failed courses when first offered. The student may also repeat a course in which s/he passed with a grade of “70” or lower only once to improve the CGPA. While all repeats shall remain on the student’s record the credits of a repeated course shall count only once, and the highest grade is used in computing GPA. A course may not be repeated more than two times, including withdrawals.

Substituting Courses

Upon the approval of the college Dean, a student may be allowed to take a substitute for a required major course if:

- The required course is not offered, or it conflicts with another required course in the semester a student is expected to graduate.
- The student had failed the course three times provided that the student is not on probation. The grades of the required and the substituted courses shall appear on the student’s transcripts and be used in calculating the student’s CGPA.

The substitute and required course shall meet the following criteria: the number of credits and level of the substitute course must be the same or higher; the course is from the

same or closely related field; and the course contents and expected competencies are equivalent.

Undergraduate Students Taking Graduate Courses

An undergraduate student may be allowed to register for a maximum of 6 graduate credits under the following conditions:

- The student is in his last year of studies to complete the requirements for an undergraduate degree, has less than a full load of registered courses in a semester, and has a CGPA of at least 80.
- Substituting for a required undergraduate course which is not offered in the semester to graduate, provided that the student's CGPA is not less than 75.

In all cases, the student must obtain the approval of the college dean.

Course Syllabus

The student is entitled to receive a detailed course syllabus at the beginning of the first class meeting. The syllabus is a way to inform the students of the course's salient features and rules and help them plan accordingly. The syllabus should include the following components: Information about the instructor – Name, contact information, office location and hours, and the manner and medium of communicating with the students; information about the course - title, brief description, prerequisites, topics covered, learning outcomes; course resources - textbook, web links, references, technology tools, and instructional materials; course activities and related deadlines - homework, quizzes, projects, research papers, presentations, group work; etc.; assessment tools and grade distribution; mapping of assessment tools with learning outcomes ensuring assessment triangulation; statement to inspire students' engagement, communication, motivation, and self-expression; and class policy on attendance, exam make-up, etc. It is expected that course instructors will make full utilization of Moodle resources in managing the learning process.

Attendance

The instructor must state the attendance policy in the course syllabus. The student is required to attend all class meetings and course-related activities and is ultimately responsible for truancy consequences. Instructors must take attendance regularly and advise truants of the ramifications of missing classes. If the number of absences reaches the 15 percent mark, the student must voluntarily withdraw from the course by following the proper withdrawal procedure and receive a W grade (see the Withdrawal section). If after accruing the 15% absences the student does not withdraw willingly, the instructor completes a ***forced withdrawal form*** and submits it to the dean for approval, by the end of the tenth week of classes, at the latest. The Dean's Office forwards the form to the Registrar's Office for action. Students who represent the country or the University in

official activities shall be allowed up to 20% absences. If the absence is due to ill health or other exigent circumstances, the student must provide evidence and plan with the course instructor on how to attend to course requirements by completing the ***attendance exemption form***. All absences excused or otherwise shall be counted and the student is ultimately accountable for the missed work.

If the course instructor does not require attendance at all class sessions, the applicable attendance policy for that course must be approved by the college dean and clearly stated in the course syllabus.

Assessment and Examinations

The College Council shall establish and continuously review and update course evaluation and examination policies and procedures applied in the courses offered by the college. A brief outline of the current policies and procedures is given below.

Performance Assessment

The student has the right to have his/her work assessed and to receive continuous and constructive feedback in accordance with the University guidelines. Assessment of student performance shall be based on the level of attainment of the course outcomes stated in the course syllabus. Assessment instruments include, but are not limited to student participation, blogs, wikis, homework, exams, drop quizzes, research papers, projects, practical work, etc. The instructor must complete a midterm performance assessment and report the results before the withdrawal deadline to give unsatisfactorily performing students a chance to withdraw and to help faculty advisors better advise students during the registration period.

Examinations

The course syllabus must state the number and dates of exams to be given during the semester. At least one major exam should be given before the withdrawal deadline to give the student a chance to make an educated decision on whether to continue or withdraw from the course.

The instructor is responsible for preparing clearly written and properly weighted exam questions in line with the course content, language of instruction, learning outcomes, and allotted exam time stipulated in the course syllabus. Appropriate answer's booklet should be given to the students with clear instructions on exam rules. The instructor shall correct the exam booklets and return them to the students within a week after the exam, and report the grades in letter form and percentage to the Department Chair a week later.

The final examinations are given during the period approved by the University and noted in the academic calendar. Instructors may need to make individual arrangements with students who have more than two final examinations scheduled on one day. A student shall not be allowed to sit in for the final examinations without having settled all his/her financial obligations to the University.

Absence from the Final Exam

If a student fails to attend a final examination without a valid excuse, the student shall receive a zero on the exam. If missing the exam is due to exigent circumstances beyond the student's control, the student may submit a petition to the Dean of the concerned college and if the Dean concludes that the stated reasons are justifiable, s/he informs the Registrar's Office to record an incomplete "I" grade to the course. The student in coordination with the concerned department and course instructor prepares to take a make-up exam to replace the "I" before the beginning of the drop/add period of the following semester. If the exigent circumstances persist, the Dean may recommend that the "I" grade be changed to "WE". For more details refer to the 'Incomplete Work' section in this catalog.

Make-up Examination

The course syllabus shall indicate the missed examinations and quizzes policy so that students are fully aware of the policy and its consequences. Normally, a student shall receive a grade of zero for the exam or quiz s/he misses. If the absence is due to a legitimate excuse for which verifiable evidence is presented, the course instructor may then give the student a make-up exam or shift the weight of the missed exam (except the final exam) to other course assessment items.

Course Grades

Course Grade Distribution

The course components, topics, associated assessment criteria and course grade distribution must be clearly stated in the course syllabus. The course grade is distributed such that appropriate weights are given to exams, quizzes, homework, projects, research papers, and student participation. In all cases the final exam grade should not exceed 35%.

Submission of Final Grades

The instructor shall enter the grades into the RHUSIS, prepare the final course grade report according to the established format, and submit the report to the Department Chair within two working days of the final exam scheduled time. Within 24 hours afterward, the department chair verifies course grade reports, secures the dean's approval, and forwards them to the Registrar's Office. The Registrar's Office audits the grades reports and rolls them into records. Students shall be able to access their grades via the RHUSIS no later than three working days after the conclusion of the final examination period.

Appeal of Course Grade

If a student feels that the grade s/he has attained on a course was unfair, s/he should discuss the matter with the instructor of the course within five days of posting the grade by the Registrar's Office. If the student and the instructor are unable to resolve the issue,

the student may submit a "**Course Grade Review Petition Form**" to the Chairperson of the concerned department within two weeks after the grade is posted. If the student's concern is legitimate, the Dean shall form a committee consisting of the department chair, course instructor, and one other faculty member from the same department to investigate the request and adjust the grade following standard procedures.

Incomplete Coursework

Incomplete coursework is subject to the following rules:

- A student who has completed most of the coursework satisfactorily but, for a verifiable compelling reason, is unable to complete all course requirements within the normal period may request, before the beginning of the final exam period, an extension to complete the unfinished work by submitting a "**Request for Time Extension Form**". If approved, a grade of "I" is temporarily assigned to the course. The instructor computes the course grade, with a zero assigned to the incomplete work, which shall be assigned to the course if the unfinished coursework is not completed by the stated deadline.
- The incomplete grade must be removed before the beginning of the drop/add period of the following semester the student is registered in. After the unfinished work is completed and evaluated, the course instructor completes a change of grade form and submits it to the dean for approval before it is sent to the Registrar's Office for final action. The final semester GPA will be calculated as soon as the final grades of the incomplete courses are turned in.
- Credit for an incomplete course will be assigned to the semester in which the course was taken.
- Graduation requirements shall be considered complete, and the student is cleared for graduation when all Incompletes are resolved.
- If the circumstances for receiving an "I" grade persist, then a grade of "WE" will be assigned to the course upon the recommendation of the Dean of the concerned College.

Change of Grade

A course grade cannot be changed after it has been submitted. If extreme circumstances warrant a grade change, the course instructor explains the reasons on a "**Change of Grade Form**" and submits it through the department chairperson to the dean for approval before it is sent to the Registrar's Office for final action within a maximum of two weeks of grades posting. Grades cannot be changed after the bachelor's degree is awarded.

Grade Point Average (GPA)

Semester GPA

The semester GPA is computed as follows:

1. Determine the course quality points by multiplying the number of the course credit hours by the numeral (see the "Grading System" section below)
2. Add the total quality points and the total number of corresponding credit hours.
3. Divide the total quality points by the total number of credit hours.

The higher grade of a repeated course is used in the computations. A “W” grade is not included in the GPA computations.

Cumulative GPA (CGPA)

The cumulative GPA is computed as follows:
1. Determine quality points of all courses taken
2. Add the total quality points and the total number of corresponding credit hours.
3. Divide the total quality points by the total number of credit hours.

Grading System

Numeric grades are used to represent student performance in a course. The letter grades are calculated according to the scheme outlined below. The minimum passing letter grade is D.

Numeral Grade	Letter Grade	Grade Value	Description
≥ 95	A+	4	Distinguished
≥ 90 and < 95	A	3.85	Excellent
≥ 85 and < 90	B+	3.75	Very Good
≥ 80 and < 85	B	3.40	Good
≥ 77 and < 80	C+	3.00	Fair
≥ 73 and < 77	C	2.70	Average
≥ 70 and < 73	C-	2.35	Satisfactory
≥ 65 and < 70	D+	1.85	Minimal Pass
≥ 60 and < 65	D	1.25	Weak
< 60	F	Zero	Fail
Other grade designations			
I	Incomplete		
P	Passing grade		
PH	Pass with Honor		
W	Withdrawal		
WE	Excused withdrawal		
CIP	Course in progress		
CR	Credit Granted		

Honors and Distinction

Semester Honor's Lists

At the end of each semester, the University recognizes students with distinguished academic achievements by enlisting their names on two honor rolls: Dean's Honor List and President's Honor List. To be eligible for an honor mention, a student must satisfy the following ***general honor conditions***:

1. Is a full-time student
2. Has no "F" grade in any course
3. Does not have any incomplete grade
4. Has not been subject to any disciplinary action

Students whose semester GPA (SGPA) is 85 or above shall be placed on the Dean's Honor List and shall receive a commendation from the College Dean. Students whose semester GPA is 90 or above are placed on the President's Honor List and shall receive a commendation from the University President.

Graduating with Distinction

Students graduating with a cumulative GPA (CGPA) 85 or above shall be graduating with "Distinction" and those graduating with a CGPA of 90 and above shall be granted a designation of "High Distinction" provided they satisfy the general honor conditions stated above. The designation shall be extolled on the students' graduation certificates and official University transcripts.

Nazik Rafik Hariri Graduate Study Award

The two students among the graduating class with the highest GPA in the College of Business Administration and the College of Engineering shall receive the Nazik Rafik Hariri Graduate Study Award. The award amounts to a full tuition scholarship to pursue a master's degree at RHU.

Withdrawal

Withdrawal from Courses

A student may, upon approval of the academic advisor, drop one or more courses during the drop/add period posted in the academic calendar – normally during the first week of classes of a regular semester or three days after the commencement of the summer semester. No record of the dropped course(s) shall appear on the student's record.

A student, upon approval of the academic advisor, may withdraw from one or more courses between the second and the tenth week of classes of a regular semester, or during the second and fourth weeks of a summer semester, provided that the student's load (excluding summer) does not fall below 12 credits. A grade of "W" shall be recorded

on the student's transcripts for each withdrawn course and the course shall be counted as a course attempt in applying course repeat policy. Approval of the College Dean is required If the withdrawal results in a load less than 12 credits.

Students who withdraw from classes after the drop period are responsible for all related tuition and applicable fees.

Withdrawal from a Semester

Formal Withdrawal. A student may, for verifiably exigent circumstances, petition to withdraw from all semester's courses at any time after the drop/add period and before the final exams begin. The College Dean may, after consulting with the concerned department chairperson, the student's academic advisor and courses' instructors, approve the petition if the reasons for the withdrawal are deemed legitimate. A grade of "WE" shall appear on the transcripts for each withdrawn course and shall not be counted as a course attempt in applying the course repeat policy. A student returning in the following semester may register by following the normal registration procedures.

Informal Withdrawal. If a student withdraws from the semester without following proper withdrawal procedures as described above, a grade of "F" shall be recorded on the student's transcripts for each registered course and that the course shall be counted as a course attempt in applying the course repeat policy.

If a student withdraws informally and decides to return later, approval of the concerned college is required. The college may approve the petition if convincing evidence is presented that the reasons for the withdrawal were beyond the student's control. In case the college approves the request, the "F" grades recorded on the transcripts shall be replaced with a "WE". A "WE" grade is not considered in calculating the student's GPA and the affected courses shall not be counted as course attempts in applying the course repeat policy.

A withdrawn student may not transfer credits for courses s/he has studied at another institution during that period unless prior approval of the concerned college was obtained.

Withdrawal from the University

Students who wish to withdraw from the University are required to complete established clearance procedures. Clearance form is available at www.rhu.edu.lb/

Leave of Absence

A student may, during the first week of a semester, petition for a leave of absence (LOA) for one or two consecutive semesters by submitting the Continuous Enrollment Registration Form for the Dean's approval and paying the LOA fee of USD 50 for each semester on leave.

A student may not accrue more than three LOA semesters during his/her study toward a degree. The LOA semesters shall count in decisions related to the maximum number

of semesters of allowed study deferment. A student returning immediately after the end of the approved LOA period may register by following the normal registration procedures.

If exigent circumstances prevent a student from returning immediately after the end of an approved LOA period and decides to reenroll in the University later, the student must seek approval for reinstatement from the concerned college. Re-enrolled students must follow the study plan and the catalog in effect at the time of re-enrollment.

A student on approved LOA may not transfer credits for courses s/he studies at other institutions unless prior approval to study those courses is attained from the concerned college.

Special Enrollment

The Special Enrollment (SE) status applies to a student who has completed course requirements but needs, for a legitimate reason, to remain active RHU student. A Students who does not register as special enrollment student for one or more regular semesters should apply for readmission to the program of interest. Refer to Informal Withdrawal policy in this catalog.

To register under the SE status, the student should:

- Complete the Continuous Enrollment Registration Form stating the pertinent reasons and submitting it to the Registrar's Office before the end of the Drop and Add Period. The form must be approved by the academic advisor, the department chairperson, and the college dean.
- Pay a Continuous Enrollment Fee of 20 USD. at the RHU Finance Office for each semester under this status. A penalty of 10 USD. shall be added if the fees are not paid during a regular payment period.

Non-Degree Students

A student who is not on track to earn a specific degree from RHU but wishes to register for courses to which s/he is eligible to take may do so as a non-degree student.

Further Studies

RHU offers students the opportunity to extend their knowledge by studying more than one major or earning more than one degree. Available options are:

1. Study double major concurrently;
2. Earn two degrees simultaneously;
3. Return to the University after graduation for a second degree

Double Major

Students may concurrently study two majors offered by the same college and have similar degree structures. A student may apply for permission to study a second major if s/he is in good academic standing and after completing at least 24 credits of coursework in the first major. Permission is granted if the student meets the admission requirements to the second major. Students must complete a minimum of 15 credits of core courses in the second major above and beyond the requirements of the first major, including all mandatory core courses of the second major. Upon graduation, one diploma specifying both majors is granted provided all the requirements of the respective majors are completed. Credits of common courses are granted to both majors.

Dual Degrees

Students may simultaneously pursue two different degrees from two different programs offered by different colleges and/or have different degree structures. A student may apply for permission to study for a second degree if she/he is in good academic standing after completing at least 24 credits of coursework in the first degree major. Application is approved if the student meets the admission requirements to the second degree major. Upon graduation, a diploma is granted for each degree major provided that all the requirements of the respective degrees are completed including the co-op experience and a minimum of 30 additional credits above the requirements of the first degree. Credits of common courses are granted to both degrees and the higher tuition rates of the two degrees shall be applied.

Second Degree

Students who had earned a degree and opt to return to the University at a later date to pursue a second degree may do so under the following conditions: (1) the admission requirements of the new degree are met; (2) applicant may be required to repeat courses if they were taken more than 3 years ago or if the acquired grade is low as recommended by the department of the second degree.

Minors

A student can pursue a minor in an area different from his/her major under the following conditions:

- Obtain a Minor Cumulative Grade Point Average of no less than 70%
- Overlapped courses between student major requirements and minor requirements are counted to fulfill minor requirements
- A student may pursue up to two minors
- A maximum of nine credits can be counted towards requirements of two minors
- Students pursuing a minor in Mathematics must take at least a three credits Mathematics course beyond what is required by his/her major

For further details please refer to the specific college section.

Allowable Study Deferment Period

The permissible period of study deferment for a bachelor student, intentional or otherwise, shall not exceed six semesters (summer excluded). In the event the six semesters limit is surpassed, the student shall be dismissed from the University. If the student decides to return later, s/he needs to apply for reinstatement subject to the approval of the concerned college. Re-instated students must follow the study plan and the catalog in effect at the time of re-instatement.

Change of Major

A student who has completed at least one semester of coursework in a major may request a change of major at any time before the thirteenth week of a regular semester (fall or spring). The dean of the college (if in case of college change) in consultation with the department chairperson of the aspired program decides on the request before the start of the following semester based on the following conditions: the request meets college admission requirements; a seat in the desired major is available; the student has not changed major before; the number of earned credits in the old major is less than 64 credits unless the student was forced out of the major for academic reasons. All earned credits which are required in the new major will be transferred and used to calculate the CGPA.

Normally, all earned credits which are required in the new major will be transferred and used to calculate the CGPA. However, if the student so wishes six credits may be deleted from CGPA if transfer is within the same college or twelve credits maximum if transfer is to a new college.

Intensive English Program students in Level 3 or 4 may request a reassignment of major before they complete 15 credit hours. Reassignment of major shall not be considered a transfer or a change of major.

Academic Complications

RHU is committed to providing students with every opportunity to thrive because their future success is all that matters. To leverage those opportunities students are urged to communicate with their instructors inside the classroom, via email, phone, social media, or the Learning Management System (Moodle) – and to regularly visit the Learning Support Centers to seek help from their peers to overcome difficulties they face in doing some homework, working on a project, writing a report or preparing for a test.

While RHU shall spare no effort to help students achieve academic success, it is inevitable that many students for one reason or the other experience academic complications that threaten their prospects. Students must manage their time effectively and tap the resources available as they undertake their academic responsibilities to avoid academic complications, otherwise they risk the consequences outlined below.

Academic Probation

A student receives an academic probation if his/her CGPA falls below 70 after attempting at least 24 credits by the second or any subsequent matriculated semester, excluding summer sessions. Students with two consecutive probations may choose to:

a) Continue in the same major with the approval of the College Council but risks academic critical standing if by the end of the following semester the student accumulates three consecutive probations.
b) Change major: if accepted in the new major, the transferred courses and CGPA will be determined according to the requirements of the new major. If the CGPA of the transferred courses is 70 or higher, the probation status is removed, and if not it shall remain in effect.

The Registrar's Office shall generate a report of students on probation at the end of every semester and send it to the colleges who will inform the student and the concerned department of the probation status.

A student may remove probation in a summer semester, but the results of the summer semester shall not cause probation.

Course Load. Normally the maximum study load for a student on probation is 12 credits (6 in a summer semester). The load may be increased to 13 credits (7 in a summer semester) if one of the courses is a 4-credit course or a 1 credit required lab course. The load may also be increased to 15 credit hours (9 in a summer semester) if the student is expected to graduate at the end of the semester subject to the approval of the concerned dean. A student on probation shall be denied access to on-line registration and must register through the academic advisor. A student on probation should be encouraged to repeat the courses with a grade of 70 or lower and must repeat failed courses when first offered.

Critical Academic Standing

A student shall be placed in *Critical Academic Standing* if s/he:

- Accrues three consecutive probations or four probations throughout the entire period of study, or
- Attains a CGPA less than 60 more than once as a matriculated student.

A student placed on *Critical Academic Standing* by the end of a regular semester shall be allowed to register in the following semester up to 15 credits (at least 9 credits of repeated courses). Based on the student's performance at the end of the semester, the student shall:

1. Resume studies in Good Standing if s/he attains a CGPA of 70 or higher;
2. Continue at RHU on CAS if s/he attains a semester GPA of 75 or above;
3. Dismissed from RHU. The college shall inform the student and the concerned of the dismissal decision.

A student on critical academic standing shall be denied access to on-line registration and must register through the academic advisor.

Forced Change of Major

A student whose CGPA falls below 60 at the end of any semester after the first semester (12 credits at least) as a matriculated student must transfer to another program and shall not be allowed to return to the old program in the future.

Academic Conduct

RHU embraces the values of academic honesty and integrity and expects all to uphold strict ethical and professional standards. The University forbids any unauthorized use of the work of others. Acts of plagiarism or cheating on exams or other types of work submitted for assessment as part of a course grade shall risk possible disciplinary action. Please refer to the Conduct Policy section in this catalog.

RHU Student Taking Courses Elsewhere

Students formally enrolled at RHU may take up to 15 credits hours of courses at a recognized university within Lebanon accredited by the MoHE or at a university outside Lebanon accredited by the country's higher education authority subject to the following conditions:

- The student is registered at RHU
- The student has completed at least 30 credit hours at RHU
- The courses to be taken elsewhere are equivalent to courses required by the student's major
- The student receives prior approval of the courses to be taken from the student's department chairperson and college dean
- A course is transferred to RHU credit if the grade attained is equivalent to 75 or better. The transfer credits do not count in calculating the CGPA.
- The student must submit certified transcripts to receive credits for transferred courses.

Normally students are not allowed to take courses elsewhere during the last two semesters prior to graduation. However, a student may be allowed to take up to 7 credits in the last semester of studies if the courses are not offered at RHU at the time. Students cannot transfer credits for courses taken elsewhere while on a leave of absence or during formal or informal withdrawal periods.

Student Records and Transcripts

The University is committed to protecting the rights of its students to privacy and confidentiality of their personal and academic records that are kept at the Registrar's

Office. Only authorized personnel are entitled to access secured Students' records. Professors are required to post exam results by student ID numbers and not by student names. Faculty advisors and academic administrators may access student's records for advising or academic decisions. Official transcripts may be issued to a third party only if a signed authorization from the student is presented or in compliance with a judicial order. Official transcripts are signed by the Registrar. Students may request an unofficial copy of the transcript or a record of their grades after two weeks of grades posting and at any time they are in need of it after that. Students can access their records and see their grades at any time through CampusVue.

Student Petitions

In case a student needs to submit a petition, it must be initiated with the help of his/her advisor. The appropriate form must be typed and completed using proper language. The advisor must verify the accuracy of the information before s/he signs the petition and forwards it to the department chairperson for approval. Student's transcripts should be attached to the petition if the decision is hinged on student's record.

Commencement Exercise

Commencement exercise is held after the conclusion of the spring semester in May. Students who complete graduation requirements in summer or previous fall may attend the May commencement exercises.

Graduates who opt not to participate in the graduation ceremony may receive their diplomas at the Registrar's Office after the commencement date.

Names on Diplomas and Degrees

Names on diplomas and degrees are spelled exactly as they appear on passports as required by the Ministry of Education and Higher Education (MoEHE). If after admission the name on the passport changes the student must update his/her records by submitting certified evidence of the change to the Registrar's Office before graduation, otherwise the old name will appear on the diploma which cannot be changed thereafter.

Co-op and Career Services

Communication and Alumni Relations
Rafal Tabbaa Khayat, Director
Phone: 00961 5 60390 Ext: 754, 755
E-mail: coop@rhu.edu.lb
www.rhu.edu.lb/coop

Co-operative Training Program

The Co-op training program serves as a bridge between the intensely learning university experience and the practical, results-oriented, highly competitive professional world. The program is designed to give the student an opportunity to test and apply knowledge, skills and competences acquired in the classrooms and labs and to develop a clear perspective about the expectations of the real world and a sharper focus on career choices. It offers an opportunity for employers and educators to collaborate in mentoring prospective workforce to becoming productive and responsible citizens. The hope is that the student after completing the Co-op experience will develop a clear purpose, become more engaged during the last year of studies, and form a pragmatic perspective about their role in a changing world.

Significance

While the Co-op work experience mutually benefits the student, the university, and the employer, it will help the student in:

- Clarifying career goals;
- Understanding of the workplace demands and constraints;
- Pursuing continuous learning and self-improvement undertakings;
- Cultivating self-reliance and self-confidence;
- Refining time management, interpersonal and communication skills;
- Building contacts with potential employers;
- Acquiring marketable skills that improve employability prospects;
- Experiencing practical aspects of the field of study.

General Policy

1. The logistical aspects of the Co-op program shall be managed by the Career Services and Alumni Relations as part of the Communication and Alumni Relations Office.
2. Training opportunities shall be approved and thereafter managed by the Assistant Manager of Career Services and Alumni Relations in collaboration with the academic units.
3. A trainee must meet the eligibility criteria set forth in this policy to participate in the Co-op program.

4. A student may arrange for a training opportunity on his/her own or, alternatively, the Co-op coordinator shall assist the student in finding a suitable training venue.
5. A student may opt to complete the Co-op training at a reputable institution abroad, subject to pertinent approvals.
6. Each trainee shall be assigned a Co-op academic advisor to follow up on the trainee's work progress throughout the Co-op period and assess the overall training experience afterward.
7. A student must commit to completing the training at the company mutually agreed to.
8. Students may register for one course during the Co-op period if it is the only course needed to graduate and the timing is approved in writing by the employer.
9. The Co-op coordinator completes the Co-op training offers in consultation with the Co-op work HR/supervisor taking into consideration employer's needs, student's interest and eligibility, and date of student's application.
10. The trainee shall work for the employer a period equivalent to eight weeks, 8 hours per day, on mutually agreeable tasks related to the trainee's field of study.
11. Trainees must conform to the employer's work rules and standards and must execute his/her tasks professionally and ethically.
12. The student shall directly report and coordinate with the Co-op work supervisor on all tasks and activities.
13. The Co-op work supervisor cannot be a direct relative to the trainee;
14. The Trainee shall keep a daily record of tasks performed and lessons learned;
15. The trainee and the Co-op work supervisor shall submit the training assessment forms to the Co-op academic advisor one week after the training is completed.
16. The trainee shall submit to the Co-op academic advisor the daily tasks log, a report, a poster, and a power point presentation immediately after the completion of the Co-op work.
17. The trainee must prepare and deliver a presentation about the training experience when requested.
18. Students are NOT allowed to withdraw from the Co-op course without prior approval of the Co-op academic advisor and the Co-op coordinator.
19. Failing to comply with the Co-op rules and employer's work standards will result in a failing grade.
20. The Co-op office and the Co-op academic advisor are always available to support the student in attaining a rewarding Co-op experience.
21. The Chairperson of the academic department is responsible for implementing the provisions in this policy related to the academic advisor and student responsibilities.

Requirements

Duration and Timing

The Co-op program runs for a minimum of eight weeks, 8 hours per day and is normally completed during the summer term of the third year of studies. Students engage in practical training experience mentored by professionals in the area related to their field of interest.

Eligibility Criteria
A Bachelor student is eligible to sign up for the Co-op program if the following eligibility criteria is met:

1. Completing ENGL 217 and the requisite number of credits with a GPA of at least 70.
2. Enrolling at the university during the training period.
3. Completing all college pre-training course requirements as stipulated below.

College	Credits	Prerequisite
Engineering	1	• Passes ENGL 217 • Senior Standing • Has a CGPA of 70 or higher
Business Administration	1	• Passes ENGL 217 • Senior Standing • Has a CGPA of 70 or higher
Arts and Sciences	1-3	• Passes ENGL 217 • Senior Standing • Has a CGPA of 70 or higher

Course Preparations

In preparation for the Co-op training, students are required to attend three seminars, Coop Policies and Procedures seminar, a CV Writing seminar, and an Interviewing Skills seminar. The Coop Policies and Procedures seminar introduces the Co-op Training Program for all Co-op Students with the required policies and procedures to follow. The CV Writing seminar helps students hone their CV writing skills. The seminar is coordinated with RHU English Language Center. Each student is required to have his/her CV reviewed by the ELC before it is submitted to prospective employers.

Students are also required to attend an interviewing skills seminar that provides them with information on how to prepare for an interview, what to expect, and how to make a good impression.

Co-op Assignment

The Co-op Office maintains a database of prospective employers and attempts to match the employer's need with the student's field of study and personal preferences. However, a student may through personal communications secure a training venue and agree with the employer on the conditions of employment. In this case the students in early spring semester must provide the Co-op Office with the contact information of the prospective employer and work supervisor and the conditions of employment for approval. Once approved the Co-op Office follows up with the prospective employer in accordance with the established Co-op procedures. Applicable rules: the organization is reputable and not owned by the student's parent; student may not be supervised by a member of the family or assigned to a department in which a member of the family works. Required Information for Co-op requests outside the offerings of the Co-op office: Organization

name, company profile (website), Job description / training plan, supervisor name, contact person and contact details.

Procedures

1. The Co-op coordinator creates a co-op Moodle course for eligible students in each college.
2. The Co-op coordinator prepares a database of prospective employers and posts job opportunities and application deadlines and communicates them to students via email and Moodle;
3. The Co-op Coordinator prepares a list of eligible students with the help of the Registrar's Office (RO).
4. A student may suggest an employer that is not on the posted list so long he/she gets a tentative approval from the employer and from the College academic advisor and the Co-op Coordinator.
5. A trainee seeking to pursue a training opportunity abroad must complete the ***Training Abroad Application Form*** (Coop-12) and submit it to the Co-op coordinator for further consideration.
6. The Co-op coordinator communicates with prospective employers and provide them with necessary information about the potential trainees' profiles;
7. The Co-op Coordinator invites eligible students to attend the Co-op orientation seminar in early spring to explain co-op policies and procedures;
8. Each eligible student completes the ***Co-op Application Form*** (Coop-3) indicating three preferred Co-op venues ranked in order of priority and submits a CV (soft copy) within the assigned deadlines;
9. The Co-op Coordinator and academic units shall attempt to match students' aspirations and field of study with employer's needs within two weeks of the submitted applications. In case multiple trainees compete for a specific training opportunity, students who apply first and meet the eligibility criteria shall be given the priority.
10. The Co-op coordinator completes the ***Co-op Training Offer Form*** (Coop-4) for each trainee and a list is sent to the college with all the details after the first week of the beginning of the training period.
11. The Co-op assignments and all related information are posted by the Co-op Coordinator on the Co-op Moodle course page, Facebook page, and via email;
12. Each academic unit informs the students of the Co-op assignment via email. The student must be aware that the employer may contact him/her for an interview before committing to the assignment;
13. The academic advisor bears the responsibility to make at least one field visit and completes the visit assessment form; continuously follow up with the trainee and the work supervisor during the training period; collects the trainee's performance assessment forms from the trainee and the work supervisor; guides the student in preparing the training report, poster and presentation and assess the submitted material; and submits a final report to the Co-op Coordinator.

Trainee's Responsibilities

Students must fulfil the following responsibilities by the indicated dates to guarantee Co-op placement and avoid any delay toward graduation.

1. Maintain contact with the Co-op office to inquire about the status of the application before training begins and update the office immediately on the work conditions during the training period;
2. Attend the orientation workshop and get familiar with the Co-op rules and regulations;
3. Set training goals in collaboration with the work supervisor and academic advisor and drive to achieve them;
4. Perform all tasks in accordance with the highest ethical and professional expectations;
5. Complete all necessary documents by the established deadlines;
6. Comply with the employer's work rules, policies and standards;
7. Closely coordinate with the work supervisor to execute tasks as planned;
8. Discuss concerns and work-related enquiries with the academic advisor;
9. Complete and submit the Trainee's Assessment of Training Form;
10. Submit a formal report, daily log of tasks, a poster and a presentation directly after completing the training period using appropriate forms;
11. Participate in the Co-op poster exhibition;
12. Complete the entire training period agreed to.

Assessment

Based on the employer's evaluation, academic advisors' assessment, and the submitted formal report, daily log of tasks, poster and presentation, the Co-op academic advisor will assign the student a Pass with Honors "PH", Pass "P", or Fail "F" grade. "PH" is reserved for a trainee who receives outstanding performance evaluation by the work supervisor and the Co-op academic advisor. A grade of "F" is given to a trainee who receives unsatisfactory evaluation by the work supervisor and the Co-op academic advisor. In this case the trainee must repeat the whole Co-op experience.

Career Services

Rationale

The Communication and Alumni Relations Office relays information on available job vacancies to RHU alumni to assist them in the employment process, career change and transitions, and networking opportunities.

Policy

1. Communicate and build a data base of prospective employers
2. Compile and announce job vacancies to students and alumni.
3. Conduct seminars to help students prepare CVs, interview skills, etc.

4. Maintain a CV data bank and send out CVs to concerned employers.
5. Communicate job vacancies to Deans/Chairs/ and faculty members and to the college administrative assistants to announce on RHU digital signage.
6. Organize an annual job fair.
7. Create a data base of on job market needs to help in curricular planning and selection of Summative Learning projects.

Procedure

1. The Career Services and Alumni Relations Assistant Manager receives information on available job vacancies from companies in and outside Lebanon;
2. The Career Services and Alumni Relations Assistant Manager posts the job vacancies with a brief description of the job requirements and the application deadlines on the **Official Rafik Hariri University Alumni LinkedIn page** and communicates them to alumni via email;
3. The company name is kept confidential in most cases based on the request of employers;
4. Alumni who wish to apply to an announced job vacancy are required to send an updated CV to the Career Services and Alumni Relations Assistant Manager on development@rhu.edu.lb;
5. The Career Services and Alumni Relations Assistant Manager communicates with prospective employers and provides them with the CVs of the potential candidates and follows up with them until the vacancy is generally filled;
6. The Career Services and Alumni Relations Assistant Manager maintains a database of all the job vacancies received, name of the companies, major area, and position level (beginner, supervisory, middle management, and top management);
7. The Career Services and Alumni Relations Assistant Manager supplements at the end of every academic year a report of all the received vacancies with insights on job market needs to help in curricular planning and selection of Summative Learning projects.

FRESHMAN PROGRAM

RHU offers a freshman program to students who have not earned a Lebanese Baccalaureate or its equivalent as a bridge to become eligible to pursue a bachelor's degree. The freshman program covers two tracks, the Freshman Arts track and the Freshman Science track. Each track encompasses 30 credits that may be completed in two semesters. The required subjects and corresponding credit hours are summarized in the table below.

Program	Humanities/ Social Sciences	Math	Natural Sciences	Free Elective	English	Arabic
Freshman Arts	12	3	3	6	3	3
Freshman Sciences	6	6	9	3	3	3

All students whose native language is Arabic must take an Arabic language course. Students who are exempted from the Arabic language requirement must take a substitute for the Arabic course to fulfill the 30 credits requirement.

Admission Requirements

To be eligible to join the Freshman Program, an applicant must hold one of the following certificates:

1- A high school certificate based on 12 years of schooling, starting with Grade One, awarded by a government or private school and recognized by the Lebanese Ministry of Education and Higher Education (MoEHE). High school certificates that are based on less than 12 years of schooling starting with Grade One are not recognized.
2- A General Certificate of Education (GCE). This applies to applicants with an A-level certificate who have completed a minimum of five subjects at the Ordinary Level and one subject at the Advanced Level or two Advanced Supplementary Levels (AS) excluding languages.

The Lebanese Ministry of Higher Education announced the below requirements to join the Freshman Program at any institute of higher education:

3- Certified copy of Permission from the Equivalence Committee of the Lebanese Ministry of Education to join the Foreign Program/Freshman class.
4- Submitting the following scores in one of the below aptitude tests before you can enroll at RHU:

Aptitude Test	Freshman Arts	Freshman Sciences
SAT-Scholastic Aptitude Test	870	950
ACT - American College Test	15	17

In addition to the documents required for undergraduate admission to RHU, applicants to the freshman programs must also:

c. Provide a certified copy of Permission from the Equivalence Committee of the Lebanese Ministry of Education to join the Foreign Program/Freshman class.
d. Submit the following scores in one of the below aptitude tests before they can enroll at RHU:

Aptitude Test	Freshman Arts	Freshman Sciences
SAT-Scholastic Aptitude Test	870	950
ACT - American College Test	17	15

Requirements of the Freshman Program Equivalency

3- **If your school is accredited by one of the following accrediting boards**, then the above requirements are enough to grant you admission to the sophomore year after you Freshman Program and get the equivalency from the Lebanese Ministry of Higher Education

Accrediting Boards:

- Western Association of Schools and Colleges (WASC)
- Southern Association of Colleges and Schools (SACS)
- AdvancED (Cognia)
- New England Association of Schools and Colleges (NEASC)
- North Central Association of Schools and Colleges (NCASC)
- Northwest Association of Colleges and Schools (NACS)
- Council of International Schools

4- **If your school is not accredited by one of the above accrediting boards**, then you need in addition to the above two requirements (a & b) to submit:
ACT Subject Tests during your freshman year at RHU and before you can start your sophomore year.

Required subjects in the ACT Subject Tests exam are:

- Mathematics I and any other two subjects for Freshman Arts
- Mathematics II and two of the following subjects: Biology, Chemistry, Physics for Freshman Science

Required scores in the ACT Subject Test:

- A minimum total score of 51 for Freshman Arts with a minimum score of 15 in each subject

- A minimum total score of 60 for Freshman Sciences with a minimum score of 17 in each subject

Please note the following:

Lebanese students will not be able to declare a major and join the sophomore class before satisfying the requirements set by the Lebanese Ministry of Education and Higher Education and the the RHU freshman program.

Study Plan

The following study plan summarizes the courses and credits distribution for the freshman program. The freshman courses are identified by having "1" as the first digit in the course number.

Freshman Arts

Course No.	Course Name	Credits	Prerequisite
Fall Semester (15 Credits)			
BECN 190	Introduction to Economics*	3	
ENGL 101	Freshman English	3	
MATH 189	Fundamentals of Algebra	3	
	Natural Science Elective	3	
	Humanities/ Social Science Elective	3	
Spring Semester (15 Credits)			
ARAB 180	Arabic Reading and Writing	3	
	Humanities/ Social Science Elective	3	
	Humanities/ Social Science Elective	3	
	Free Elective	3	
	Free Elective	3	

* Required for application to the College of Business.

Freshman Science

Course No.	Course Title	Credits	Prerequisite
Fall Semester (15 Credits)			
ARAB 180	Arabic Reading and Writing	3	
ENGL 101	Freshman English	3	
MATH 190	Calculus I	3	
PHYS 190	General Physics I	3	
	Humanities/Social Science Elective I	3	
Spring Semester (15 Credits)			
MATH 191	Calculus II	3	MATH 190
PHYS 191	General Physics II	3	PHYS 190
	Natural Science Elective	3	

	Humanities/Social Science Elective II	3	
	Free Elective	3	

Courses Description

I. Mandatory Courses

Descriptions of the programs mandatory courses are given below.

ARAB 180	**Arabic Reading and Writing**	**3(3,0)**
This freshman-level course is designed for native speakers of Arabic with the aim of developing their reading and writing skills. This course is conducted in Arabic. Students will read and discuss essays, articles and other readings, and write essays. It fulfills the Freshman Arabic language requirement. The course is mandatory for all native Arabic speakers.		

BECN 190	**Introduction to Economics**	**3(3,0)**
This course is designed to help students develop a basic general understanding of economic principles, issues, history, and institutions. It develops their economic literacy and teaches them how economics relates to the everyday life of individuals, businesses and society in general. Topics include markets, firms, economic systems, role of government in the economy, capitalism, macroeconomic indicators and the basics of supply and demand.		

ENGL 101	**Freshman English**	**3(3,0)**
This course is designed to help students develop their reading and writing skills. It focuses on the interrelatedness between reading and writing whereby students critically read and analyze passages of different rhetorical modes (classification, cause/ effect analysis, and comparison/contrast analysis) and learn to write similar essays on these modes. Some grammatical as well as structural elements are reviewed to help students develop accuracy in their writing. In this course, students are also introduced to research skills such as evaluating sources, paraphrasing, summarizing, and quoting while following the APA style.		

MATH 189	**Fundamentals of Algebra**	**3(3,0)**
Real number systems, radicals and rational exponents, polynomials, factoring, fractional expressions, lines in the plane, functions and their graphs, inverse functions, solving equation and inequalities, real zeros and the fundamental theorem of Algebra, exponential functions and their graphs, logarithmic functions, and their graphs.		

MATH 190	**Calculus I**	**3(3,0)**
Functions and their graphs, limits and continuity, differentiation, applications of derivatives, Extreme values and mean value theorem, definite and indefinite integrals, the substitution method.		

MATH 191	Calculus II	3(3,0)
Inverse trigonometric functions, integration techniques, parameterizations and parametric curves, vectors and dot and cross products, Lines and planes in space, curves in space, curvature and normal vectors of a curve. **Prerequisite**: Math 190.		

PHYS 190	General Physics – Mechanics	3(3,0)
This course introduces students to the basic concepts and principles of Mechanics: Vectors, displacement, velocity, acceleration, motion in 1D, projectile motion, forces, Newton's laws of motion, work, energy, momentum, collision, torque and rotational motion.		

PHYS 191	General Physics - Electricity and Magnetism	3(3,0)
This course is an introduction to electricity and magnetism. In this course, students will explore electric charges, electric forces and electric fields, electrical energy and potential, capacitance, direct-current circuits, magnetic force, magnetic field, induced voltage and inductance, alternating-current circuits, and electromagnetic waves.		

II. Electives

Descriptions of the possible elective courses are given below.

BACC 150	Introduction to Accounting	3(3,0)
Students in this course will learn the basic concepts and techniques of accounting, including accounting information systems, costing, estimation, and some aspects of management accounting.		

BADM 155	Introduction to Law	3(3,0)
This course covers the basic tenets of the legal system and how they may apply to various business sectors and industries.		

BIOL 102	Introduction to Biology	3(3,0)
An introductory course to the fundamental principles of biology which covers the following topics: chemical basis of life, the structure and function of cells and systems, genetics, and human body systems.		

BIOL 170	Basic Concepts in Biology	3(3,0)
A freshman level course that introduces students to the basic concepts of genetics, evolution, and ecology, and explores the forms and functions of plants and animals.		

BMGT 150	Basics of Management	3(3,0)
This course provides a general overview of management basics, including principles of management science, buying and selling and management in general.		

BMGT 155	Introduction to Hospitality Management	3(3,0)
Students will learn the basics of different aspects of hospitality, such as food, lodging, beverages, and pastries. They will also be exposed to hospitality operations in hotels, restaurants, and resorts.		

BMKT 150	Introduction to Business and Commerce	3(3,0)
This course introduces students to nature of business, types of commercial activities, market analysis and commercial activities interrelationships.		

CCEE 111	Computer Programming	3(3,0)
This course introduces students to the fundamental programming concepts such as variables, loops, conditional statements, and event handling. It also helps students learn how to use math and computer code to think creatively.		

CCEE 112	Internet Development and Support	3(3,0)
This course covers issues related to the development and implementation of internet-related tools and services. Topics include Internet organization, site registration, e-mail servers, Web servers, Web page development, legal issues, firewalls, multimedia, TCP/IP, service providers, FTP, list servers, and gateways.		

CCEE 121	Computer Technology	3(3,0)
This course is designed to help students understand the basic functions of a computer as a human-machine interacting **system**. It covers the basics of computer technology in today's world. Students will focus on the following components of computer: keyboards, operating systems, word processing, spreadsheets, database management, presentation graphics and the internet.		

CCEE 122	Computer Hardware	3(3,0)
This course introduces the technical aspects of the computer hardware units. Topics covered are computer organization, communication inside the computer and communication with the outside world.		

CCEE 123	Introduction to Computer Troubleshooting	3(3,0)
In this course, the students will learn how to set up a computer, how to diagnose simple faults on a computer and the methods used to troubleshoot them.		

CCEE 131	Introduction to Audio-Visual Technology	3(3,0)
In this course, the students will be introduced to the different technologies involved in the Audio and Video Communication systems. The course includes video production, multi-media, sound, animation and photography.		

CCEE 141	Switching Systems Technology	3(3,0)
This course includes public switched telephone network, the telephone and the local loop architecture, inter-exchange networks, and signaling; Evolution of switching		

technology and architectures and a comparison of various systems; Traffic statistics and the theory of space-division and time-division switching networks.

CCEE 142	Basics of Analog and Digital Communications	3(3,0)
This course covers the following topics of analog and digital communication systems: basic principles of telecommunication systems, principles of operation and application of various transducers, and basic principles of modulation and demodulation.		

CHEM 160	Chemistry I	3(3,0)
Students study the principles and methods of chemistry including atomic structure, periodic trends, writing formulas, and determining the names of both inorganic and organic formulas.		

CHEM 170	Chemistry II	3(3,0)
Students learn about acids, bases, and chemical equilibriums; the groups in the periodic table, organic chemistry, and nuclear will be also surveyed.		

CIVE 105	History of Architectural Technology	3(3,0)
The study of architectural technology from the Greek civilization to the present stressing the development of structural systems and the exploration of materials. This course will explore the interaction of building design and historic socio-economic determinants.		

CIVE 120	Introductory Strength of Materials	3(3,0)
The study of stress and strain, deformation, simplified analysis of torsion, shear and stresses in beams, design of beams, deflection of beams, columns. Reference to applications for civil and mechanical engineering technology. Introduction to materials testing.		

CIVE 121	Concrete Construction Methods and Concrete Structures	3(3,0)
Emphasis is placed on the practical application of structural design principles for new and existing concrete structures. Study of concrete structures using basic physical laws. Detailing basics, from foundation to roof as well as the study of concrete properties and applications with an emphasis on concrete, masonry and shallow foundation systems. Conditions encountered during renovations and their solutions will be included.		

CIVE 135	Plumbing and Air Conditioning	3(3,0)
Review of water distribution plumbing and related fundamentals. This course covers the basics of piping, valves, backflow prevention, water quality and hydraulic fundamentals. Review of air-conditioning fundamentals, piping, capacity requirements, and recent developments in materials, fixtures, and appliance.		

CIVE 140	Introduction to Surveying	3(3,0)
A study of topographic surveying and mapping. Determination of land areas, construction surveys and layout, control surveys, boundary surveys, route locations and street layout. Provides experience with the use of equipment, instruments and the fundamental techniques of surveying		

CIVE 141	Fundamentals of Topometry	3(3,0)
Measurement and graphic description of topography, topometric descriptions of objects through using various techniques in mapping		

CIVE 142	Photogrammetry	3(3,0)
Principles and techniques of vertical aerial photograph photogrammetry, distance, direction, area and photograph scale calculations and interpretation.		

CIVE 143	Geodesy	3(3,0)
Horizontal and vertical datum, gravitation and centrifugal forces, measurements of gravity and reduction of gravity, geoid and ellipsoid, deflection of the vertical; orthometric and dynamic heights		

CIVE 144	Mapping	3(3,0)
Topographic mapping and spatial analysis, map production and cartography, spatial reference systems, scale, projections, generalization, and symbolization.		

CIVE 145	Geomorphology	3(3,0)
Surface processes and landforms, their implications for land use and present, past, and future landscape development, weathering, glacial and fluvial processes, mass wasting, and tectonic controls on landforms.		

CIVE 146	Construction and Surveying Regulations and Laws	3(3,0)
Construction and surveying regulations and laws in Lebanon and its applications to land usage, urban development, residential and commercial buildings, with emphasis on the construction field, the law of practice and professional registration		

CIVE 148	Introduction to Public Works	3(3,0)
This course introduces students to construction, alteration, repair, or improvement on public land that is executed at the cost of the state or any other local public agency. Skills in: Public administration, supervision of public works are emphasized.		

CVLN 160	Monotheistic Religions: A Comparative Study	3(3,0)
This course covers the three monotheistic religions. It compares the idea of God and the law among Judaism, Christianity and Islam.		

CVLN 161	The Arabs	3(3,0)
This course provides a review of the history of the Arabs from the pagan days through the twentieth century.		

CVLN 170	God and Creation: East and West	3(3,0)
A literary attempt to understand the origins of the universe as found in texts from a variety of world cultures.		

CVLN 180	Youth and the Growing Up Process	3(3,0)
An introduction to the themes and challenges of autonomy and independence as experienced by youth, studied through major literary works of the past centuries.		

CVLN 181	Arab Renaissance	3(3,0)
The Arab renaissance is studied through historical and socio-political texts.		

CVLN 190	Freshman Art History	3(3,0)
This course provides an overview of art and its development in the western world. It covers the main art periods from “Prehistoric Art” through ‘Contemporary Art’ and the effect of the socio-political cultures of the times.		

ELEC 101	Electrical Drawing	3(3,0)
This course covers reading and interpreting electrical installation drawings, performing electrical installation, machines and electronics circuit drawings using standard symbols. This course also covers using standard computer packages to perform electrical drawings. This course will also enable students to understand the installation of various electrical/electronic systems as well as installation of various wirings in buildings.		

ELEC 111	Industrial Electricity	3(3,0)
The course will introduce and cover circuit variables and elements, methods, and techniques for the analysis of DC and AC circuits, 3 phase systems, power calculations. Fundamentals of industrial devices and equipment will be introduced as well as topics related to the safety around such devices and equipment.		

ELEC 121	Digital Electronics	3(3,0)
This course covers an introduction to different logic gates, developing truth tables for combinational logic circuits, simple Boolean expression for logic gates and description the fundamental concepts of ICs.		

ELEC 122	Analog Electronics	3(3,0)
This course aims to deliver a basic understanding of the principles of analog electronics, basic principles of operation of diodes, transistors, and Op Amps. This course also covers basic design of analogue amplifiers and gain stages.		

ELEC 123	Industrial Electronics	3(3,0)
This course provides a basic knowledge of circuitry for the control and conversion of electrical power with high efficiency converters. Converters covered change and regulate voltage, current, or power; examples are dc-dc converters, ac-dc rectifiers, dc-ac inverters.		

ELEC 131	Electrical Power Generation and Distribution	3(3,0)
This course covers, the principles of generation of electrical power, the principles of distribution of electrical power and the methods used for protection of electrical power systems.		

ELEC 132	Electric Machines	3(3,0)
This course covers, understanding the construction, principles of operation, characteristics, and application of DC machines; basic principles of the transformer; the construction, principles of operations and application of AC machines.		

FADR 100	Basic Drawing	3(2,2)
This course teaches students the basics of drawing with lines, shapes, tones, shadows, and colors. Still life set-ups are used to develop the students' observational skills and drawing techniques. Students experiment with a wide range of drawing media (charcoal, pencil, graphite, and ink) to develop both their technical abilities and creativity.		

FADR 115	History of Art Overview	3(3,0)
This course is a comprehensive overview of the artistic movements that occurred over the centuries with an emphasis on the 20th century. It explores the forms, purposes, meanings, and principles of the artistic styles that influenced cultures across the globe. The course also introduces students to basic analytical tools to critically analyze art within its cultural, political, and historical context.		

FADR 120	Introduction to Color Theory	3(3,0)
This course focuses on the principles, theories, and applications of additive and subtractive color as they apply to the visual communication design process. Students investigate color schemes, color mixing, color properties and color relationships; as well as examine the psychological, cultural and symbolic aspects of color and how they relate to visual communication.		

FADR 130	Basic Digital Photography	3(2,2)
This course introduces students to the basic concepts and practices of digital photography. Students learn how to use the camera, lenses, and other basic photographic equipment to create professional images. It introduces students to the aesthetic principles as they relate to composition, space, exposure, light and color. Students also acquire skills in digital manipulation and learn the technological requirements of digital formats and resolution.		

GRDS 150	Introduction to Arabic Calligraphy	3(2,2)
This course introduces students to Arabic Calligraphy, which is one of the highest art forms of the Arab world and a primary form of art for Islamic visual expression and creativity. Students will learn about the history of Islamic Calligraphy, its origin, tools and styles (Riqa, Naskh, Deewani, Thuluth and Kufi). In addition to that, students will gain hands on experience in basic lettering and Kufic compositions.		

GRDS 160	Principles of Advertising	3(3,0)
This course introduces the basic principles of advertising and their role in media and society. It is an overview of the advertising industry, its functions, and practices within the broader communications context. This course examines: advertising agencies, advertising professional roles, agency and client relationships, target audiences, media, ethics, and creative and strategic thinking. A short historical analysis of advertising is included to shed t on the important role social forces have played in the evolution of advertising.		

HIST 100	History of the Ancient World	3(3,0)
This course examines a range of topics including the origins of civilization in Egypt and Mesopotamia, the civilization of Ancient Greece and Rome, the origins and development of Judaism, and the early Christian Church. **Co-requisite**: ENGL 101.		

HIST 102	Europe from the Reformation to the French Revolution	3(3,0)
A survey of European history beginning with the 16th century Protestant Reform and including absolutism, the scientific revolution, the Enlightenment, the old regime, and the French revolution. **Co-requisite**: ENGL 101.		

HIST 103	Europe in the 19th and 20th Centuries	3(3,0)
Topics include the Industrial revolution, the rise of political ideologies, social classes, nationalism and imperialism, the Russian Revolution, the two world wars, the inter-wars period, and the cold war era. **Co-requisite**: ENGL 101.		

HIST 108	Issues and Themes in U.S. History: 1607-1877	3(3,0)
American history from 1607 to 1877 examines the development of the United States from early settlement through the Civil War era. Emphasis is placed on the evolution of American politics, race relations, economic and social trends, and western expansionism. **Co-requisite**: ENGL 101.		

GEOL 160	Earth Geology	3(3,0)
This is an introductory course designed to provide a general overview of some aspects of the Earth's natural environment and system. It Introducers the processes and physical systems of the earth that are important in controlling its environment. In addition, the course talks about the relationships between various earth systems and processes, and their environmental effects.		

PHIL 102	Freshman Philosophy	3(3,0)
This course is an introduction to the part of philosophy concerned with questions about the ultimate nature of the world we live in and our knowledge of it. The issues discussed include: the existence and nature of God, the place of human beings in the universe, the nature of reality, human nature, human knowledge and skepticism, freedom and determinism, and the relationship between mind and body. The emphasis of the course varies from instructor to instructor. **Co-requisite**: ENGL 101.		

PHIL110	Critical Thinking	3(3,0)
This course is an introduction to basic rules of clear and rational thought. Students are offered extensive analysis of examples on how to detect false reasoning, illegitimate appeals to emotions, inconsistencies, and contradictions. The goal of this course is to develop logical awareness to the point that a person can no longer be victimized by the rhetoric of everyday life and can develop arguments with clarity and confidence. **Prerequisite**: Native English speakers or English 098. **Co-requisite**: ENGL 101.		

POSC 190	Freshman Politics	3(3,0)
This survey course is recommended for students interested in discovering how politics impact their lives and how they in turn can affect politics. Students are introduced to the basic concepts of Political Theory, Comparative Politics, International Relations, and Public Policy. **Co-requisite**: ENGL 101.		

PSYC 190	Freshman Psychology	3(3,0)
This course is aimed at developing some understanding of human psychology by focusing on the elements that affect human behaviors and mental processes. Among others, it covers topics on cognition, emotions, learning, human development, biological bases of behavior, personality, psychological disorders, psychotherapy and behavior change, and social behavior. **Co-requisite:** ENGL 101.		

PSYC 195	Freshman Stress Management	3(3,0)
This course addresses the basic principles, theories, and techniques to effectively manage personal stress. Students will gain a greater understanding of the mind-body relationship, learn to employ a holistic approach to stress and adopt effective cognitive techniques, copy skills and relaxation techniques. **Co-requisite**: ENGL 101.		

SOCI 190	Freshman Sociology	3(3,0)
This course is designed to give freshman students an overview of the field and to familiarize them with some essential sociological concepts. It focuses on the individual in society, the study of society, social institutions, and human agency. In particular, the course will pay attention to how people's lived experiences are both shaped by social forces and reshaped through human action. **Co-requisite**: ENGL 101.		

Joining Degree Programs

Students may join a degree granting program at RHU after successful completion of the freshman program if they attain the freshman year - to - Lebanese Baccalaureate equivalency certificate from the Equivalence Committee of the Lebanese MoEHE. Students on the Freshman Arts track may join the Graphic Design program, or any program offered at the College of Business Administration or the College of Arts. Students on the Freshman Science track are eligible to join any degree granting program offered at the University. Additional requirements to join specific programs are summarized below.

Business Administration programs. A GPA of at least 70 and a grade of at least 70 in both MATH 189 or MATH 190 and BECN 190.

Engineering Programs. A GPA of at least 70, and a minimum grade of 70 in MATH 190, MATH 191, PHYS 190, and PHYS 191.

Computer Science Program: A GPA of at least 70 and a minimum grade of 70 in both MATH 190 and MATH 191.

Graphic Design Program. A GPA of at least 70 and passing the RHU Graphics Design Aptitude Test.

Healthcare Information Systems Program: A GPA of at least 70 and a minimum grade of 70 in both MATH 190 and MATH 191.

GENERAL EDUCATION

Mission

Conforming to the University mission, the General Education program aims to improve students' awareness and intellectual capacity to deal with the complex and diverse issues and challenges confronting the world around them and empower them to wisely consider those issues in their personal and professional decisions and choices.

Learning Outcomes

Upon completion of the General Education Program, students will demonstrate:

- Critical thinking in evaluating scholarly sources and arguments;
- Information literacy and skills in applying modern computing tools and techniques;
- Ability to make informed decisions based on ethical principles and reasoning;
- Aptitude for aspiring continuous improvement and lifelong learning.

Domains of Knowledge

Every RHU student must take 30 – 33 credit hours of general education courses distributed over six domains as described below. Twenty-one mandatory credits are selected from domains 1, 4, 5 and 6 and 9-12 elective credit hours selected from domains 2 and 3:

Domain		Credits	Courses
1	Communication Competency*	9	ENGL 210: English Composition and Rhetoric ENGL 217: Professional English Communication ARAB 212**:** Arabic Language and Communication CMNS 200: Etiquette
2	Humanities/Fine Arts	3-6	Selected from an approved list
3	Social Sciences/Culture	6	Selected from an approved list
4	Natural Sciences and Technology	6	Per major requirement*
5	Quantitative Reasoning	3	Per major requirement*
6	Community and Sustainability	3	Per major requirement*

* Refer to the introductory section of the college of interest for description of courses specific to domains 4, 5 and 6.

Domain Specific Courses

Communication Courses

ARAB 212	Arabic Language & Communication	2(2,0)
This course helps students develop their ability to communicate effectively in standard Arabic. It provides students with the necessary communication skills in Arabic they might neeand has d in their future jobs. Specifically, students learn how to write and orally present different forms of workplace documents in Arabic.		

CMNS 200	Etiquette	1(1,0)
This course is designed to help students develop interpersonal and communication skills fundamental for success in the workplace no matter what industry, organization, or sector they are employed in. Students will improve their professional style as they study topics including polite conversation, personal appearance, office politics, diplomacy, telephone, cell phone, and voicemail etiquette, the protocol of meetings, job interview presentation and even international travel. Students will participate in an off-campus formal dining experience. **Co-requisite:** ENGL 210.		

ENGL 210	English Composition and Rhetoric	3(3,0)
This course reviews the fundamentals of good academic writing in English, teaches essay writing essentials and research skills in two rhetorical modes (persuasion and argumentation), and provides practice in writing essays in these modes, research paper, and oral presentation. **Prerequisite**: ENGL 101 or TOEFL 550+ (paper) or 80+ (computer).		

ENGL 217	Professional English Communication	3(3,0)
This is a required course designed to help students develop effective professional communication skills, both orally and in writing. In this course, students learn how to write emails, memos, letters, proposals, reports, and other forms of employment correspondence. In addition, this course helps students sharpen their presentation skills. Broadly, this course enables students to behave professionally and effectively in their prospective jobs. **Prerequisite**: ENGL 210.		

Elective Courses

Description of the Courses that satisfy Domain 2, and 3 requirements are given below.

Humanities/Fine Arts

Descriptions of elective courses that may be chosen to satisfy the Humanities/Fine Arts domain are given below.

BADM 355	Business Ethics and Social Responsibility	3(3,0)
This course introduces students to the contemporary principles of ethics and social responsibility in business. Students learn to make ethical judgments on important		

ethical issues they face every day by relating those issues to a framework of ethical principles which includes utilitarianism, justice, moral rights, ethic of care, and vices and virtues. Ethical dilemmas related to conflict of interest, sustainability in business strategy, and corporate governance are examples of issues discussed in this course. Prerequisite: Junior Standing.

CMNS 360	**Ethics in Communication**	**3(3,0)**
This course explores the theoretical and practical ethical questions about communication in four contexts: interpersonal, workplace, communication in one's community and society, and mass and digital communication. Discussion of ethical theories in communication studies will provide a basis to explore case studies and contemporary communication dilemmas, heightening personal sensitivity to the underlying ethical implications of human communication. **Co-requisite:** ENGL 210.		

CMNS 320	**Creative Nonfiction**	**3(3,0)**
In this course students will learn rhetorical modes in short essays and journalism, including memoir, reportage and reflective essays. Students will practice a writing style that focuses on conciseness and clarity, effective oral presentations, and the reading of articles, essays and other materials of increasing complexity. **Co-requisite**: ENGL 210.		

CVLN 301	**Civilization Studies I**	**3(3,0)**
This course surveys some of the key figures, movements, and texts in cultural studies, from the birth of civilization through the Middle Ages. Concentration will be on the historical, political, religious, cultural, and institutional aspects during this period. Students will read, analyze, and interpret certain primary works to gain insight into the contexts in which they originated. **Co-requisite**: ENGL 210.		

CVLN 302	**Civilization Studies II**	**3(3,0)**
This course surveys some of the key figures, movements, and texts in cultural studies, from the 14th through the 18th centuries. Concentration will be on the historical, political, religious, cultural, and institutional aspects during this period. Students will read, analyze, and interpret certain primary works to gain insight into the contexts in which they originated. **Co-requisite**: ENGL 210.		

CVLN 303	**Civilization Studies III**	**3(3,0)**
This course surveys some of the key figures, movements, and texts in cultural studies, from the 19th century up to the present time. Concentration will be on the historical, political, religious, cultural, and institutional aspects during this period. Students will read, analyze, and interpret certain primary works to gain insight into the contexts in which they originated. **Co-requisite**: ENGL 210.		

EDUC 201	**Fundamentals of Education**	**3(3,0)**
This course is a study of the modern principles of education and their application in elementary and secondary schools. It includes the examination and discussion of		

teaching procedures and techniques as well as considerations of the historical, cultural and societal views of schooling.

EDUC 211	**Fundamentals of Special Education**	**3(3,0)**
This course introduces Special Education, particularly addressing current practices. Students are introduced to common learning disabilities and intervention programs, as well as an historical overview of the development of the field of Special Education.		

EDUC 312	**Educational Philosophy**	**3(3,0)**
This course provides a survey of the development of thought about education through the study of major philosophical writings considered in historical context. **Prerequisite**: EDUC 210.		

EDUC 360	**Children's Literature**	**3(3,0)**
This course draws on the theoretical and practical aspects of the study of literature for children. Students develop both wide familiarity with children's books and understanding of how children's literature fits into the elementary school curriculum.		

EDUC 365	**Art Education**	**3(3,0)**
This course explores concepts of art, music, drama, and movement for young children. The various methods are used to cover various activities associated with the development of children's physical-motor, social-emotional, and cognitive skills, with providing conditions to develop creativity and aesthetic awareness.		

ENGL 214	**Introduction to English Poetry**	**3(3,0)**
This course introduces freshman students to poets whose poetry is of intrinsic literary merit. In addition to broadening the students' understanding and appreciation of literature, the chief aim of the course is to develop the student's critical thinking and analysis and to encourage original responses to literary expression in well-developed oral and written criticism. Co-requisite: ENGL 210.		

ENGL 220	**Introduction to Literature**	**3(3,0)**
This course is an introduction to literature through works of fiction, poetry, and drama. It introduces students to the pleasures of reading literature and to interpretative approaches to literature. It aims to provide students with competence in critical thinking and practice in close reading and analysis, knowledge of the formal characteristics of each genre, and appreciation of literary excellence. Readings include a variety of short stories, poems and plays selected from a wide range of British, American and World literature. Co-requisite: ENGL 210.		

ENGL 222	**Introduction to Language**	**3(3,0)**
This survey course examines current areas in theoretical and applied linguistics including the different levels of structure, the nature of language acquisition, language variation and evolution, and language teaching. **Co-requisite**: ENGL 210.		

ENGL 223	Introduction to Drama	3(3,0)
In this course, you will explore what drama is, its basic elements, and its dramatic structure evolution over centuries. You will study selected and representative plays of different periods that help you broaden your understanding and appreciation of literature. The course also aims to develop your critical thinking and analysis and encourages you to respond critically to drama works in well-developed oral and written criticism.		

ENGL 230	Shakespeare's Plays	3(3,0)
In this course, students study representative comedies, histories, and tragedies by Shakespeare. The plays are read intensively and understood in the context of the theatrical conventions of the period and the culture of play going in early modern England, as well as the social, cultural, religious, and intellectual history of the period. Co-requisite: ENGL 210.		

ENGL 235	Creative Writing	3(3,0)
This course introduces students to the process and practice of imaginative writing. Students will read works of fiction, creative non-fiction, and poetry, and will learn techniques for writing in those genres. **Co-requisite**: ENGL 210.		

ENGL 252	Introduction to American Literature	3(3,0)
This course explores the works of major literary figures and authors representing different literary schools from the sixteenth century to modern times. Students will closely examine selected texts as literary achievements and set them within the historical context and framework of American culture. Co-requisite: ENGL 210.		

ENGL 300	Introduction to World Literature	3(3,0)
The course surveys selected works in English or in translation from non-Anglo American cultural traditions. Texts can be drawn from African, Asian, European, Latin American, and Middle Eastern literatures with a focus on their historical and cultural contexts. Co-requisite: ENGL 210.		

ENGL 330	Language Acquisition	3(3,0)
This course will survey language acquisition theories. It will deal with human language processing, learners' motivational factors and contextual factors, which influence language learning. It will uncover the principles of first and second language acquisition. **Co-requisite**: ENGL 210.		

FADR 215	History of Art	3(3,0)
This course explores the major forms of artistic expression from the ancient world to the present from a variety of cultural perspectives. Students learn how to look at and analyze works of art within their historical context, and how to articulate what they see or experience in a meaningful way. This course covers Pre-Renaissance, Renaissance, Post Renaissance and the rich layers of 19th and 20th Century Modern Art up until the manifestations of our present day.		

GRDS 230	Photography I	3(2,2)
This course teaches students the basics of black & white digital photography. It is a lecture-based course with extensive hands-on practical training. Students learn how to develop an eye for taking pictures and framing objects. They also enhance their knowledge about the different parts of a camera and the mechanism of printing and developing films while continuously scanning other photographers from contemporary and historical scenes.		

HIST 210	History of England	3(3,0)
This broad survey course provides a narrative of British history from 1066 through the present, including political, social and cultural developments. Co-requisite: ENGL 210.		

HIST 350	History of the Arabs in the Classical Period	3(3,0)
This is an elective course whose major objectives are to familiarize students with the Arab peoples' history. The course's emphasis will be to explain: The early Arab conquests of Bilad al-Sham, Egypt, Persia, North Africa, the internal civil strife inside the early Muslim community, the emergence and development of the Umayyad caliphate, and the emergence and development of the Abbasid Empire.		

HIST 360	Contemporary History	3(3,0)
This is an elective course whose major objectives are to familiarize students with contemporary issues to enhance their level from historical and cultural points of view. Co-requisite: ENGL 210.		

HIST 365	History of Europe in the Middle East	3(3,0)
This course examines the ties between Europe and the Middle East in the 19th and 20th centuries, focusing on the reaction of Middle Eastern societies to European intervention and influence. **Co-requisite**: ENGL 210.		

HIST 370	The Economic and Social History of the Middle East	3(3,0)
This is an elective course whose main objective is to familiarize students with various events that shaped the evolution of social and economic developments of the Middle East to enhance their level from the historical and economical dimensions. **Co-requisite:** ENGL 210.		

HIST 480	Special Topics in History	3(3,0)
This course provides an in-depth look into selected issues related to historical events across ages and development. Through readings, research, discussion and guest lectures current issues related to historical events across ages and development are thoroughly explored. Prerequisite: Consent of the instructor.		

MUSC 301	Introduction to the World of Western and Arabic Music: Theory and Practice	3(3,0)
Music is considered among the essential Humanity Courses at most Universities around the world. This course will cover a brief historical review of Western and Arabic music; the Art of listening music; important musical terminology; fundamental of tuning and pitch frequencies in Western and Arabic music ; the seven most important elements of music: Rhythm, Melody, Harmony, Timbre, Dynamics, Texture, and Form; the technical interference behind the development of Western and Arabic musical scale-structures; introduction to reading Western and Arabic sheet music; Chords structure, Chords progress, and Arpeggios; the use of the guitar in the Arabic music.		

PHIL 301	Major Trends in Philosophy	3(3,0)
This is a study of some major topics in philosophy. The course emphasizes theory of knowledge, theory of mind, determinism and free will, and morality and ethical values. Along with some assigned readings, students will watch movies, the analysis of which will help them comprehend the content of the course better. **Co-requisite**: ENGL 210.		

PHIL 303	Introduction to Ethics	3(3,0)
People often wonder about what makes good ways to live and right ways to act. They also speculate about what is the best way of life, what action is right, and what sort of authority moral claims have over us. The course introduces students to the major moral theories and thinkers that address these types of questions. **Co-requisite**: ENGL 210.		

PHIL 307	Business Ethics	3(3,0)
This course is an introduction to contemporary philosophical thinking on ethical issues in business. Students will be exposed to important ethical issues they might face; asked to give sound ethical judgment to problems they might face in their line of work; helped become armed with a set of codes that will prepare them to confront and resolve ethical dilemmas they might encounter at work; and enabled to apply the techniques for analyzing and resolving ethical problems when they arise. **Co-requisite**: ENGL 210.		

PHIL 310	Philosophers of Peace	3(3,0)
This course introduces students to peace building and conflict prevention through the examination of the main theories on peace and security. It examines ideas of Thucydides, Aristotle, Erasmus Grotius, Kant, Gandhi and other thinkers for whole peace was a high value. It develops students' critical skills and understanding necessary to translate their academic learning to specific practical situations, such those posed by peace building either with the UN, governments, or NGOs. It helps to understand the complex and interconnected challenges to peace and provides knowledge to meet these challenges. **Co-requisite**: ENGL 210.		

PHIL 480	Special Topics in Philosophy	3(3,0)
This course provides an in-depth look into selected issues related to philosophy and philosophical thinking. Through readings, research, discussion, and guest lectures		

current issues related to philosophy and philosophical thinking are thoroughly explored. **Prerequisite**: Consent of the instructor.

THEA 301	Introduction to Theatre	3(3,0)
This course will allow students to experience the process of making theater. Its outcome is a theatrical production where students are involved in different roles: script writers, actors, and/ or production crew, such as house managers, designers, and operators. The work is conducted under the supervision of the course instructor. **Co-requisite**: ENGL 210.		

Social Sciences/Culture

Descriptions of elective courses that may be chosen to satisfy the Social Sciences/Culture domain are given below.

BECN 301	Microeconomics	3(3,0)
Students will study the general principles of microeconomics. Included are the theoretical constructs of consumer behavior, cost structure, and the operations of business firms in the market economy under conditions of perfect competition, oligopoly, monopoly, and monopolistic competition. **Prerequisite**: Junior Standing.		

BECN 302	Macroeconomics	3(3,0)
Students will study the general principles of macroeconomics. This course presents the formal Keynesian theory of income determination and its contemporary critiques, including the study of the possible causes and solutions to unemployment and inflation and the importance of the international economy. Government fiscal and monetary policies are examined in detail. **Prerequisite:** Junior Standing.		

BMGT 200	Introduction to Management	3(3,0)
Students study the basic functions of management and are exposed to modern management practices, current events, problem solving, and ethical dilemmas. Topics include decision making, strategic and operational planning, organizational structure, Human Resources management, leadership, and control techniques. The instructor facilitates discussion and integrates these topics using contemporary business issues and case studies. **Co-requisite**: ENGL 210.		

CMNS 310	Persuasion in a Mediated World	3(3,0)
Through reading, writing and speech, students will become familiar with the persuasive strategy described in Aristotle's Rhetoric, and consider how that strategy can be employed in professional and personal situations in writing, public speaking, and negotiation. **Co-requisite**: ENGL 210.		

CMNS 350	Mass and Digital Communication Ethics	3(3,0)
This course addresses the ethical problems that arise in the fields of journalism, public relations, and advertising, particularly in today's digital media environment. **Prerequisite**: CMNS 301.		

CMNS 380	Social Media Campaigns and Strategies	3(3,0)
This course examines the strategic uses, impacts and implications of emerging and social media, and examines the ways in which social media impacts the daily lives of our society and its individual members. It expands the student's knowledge of social media applications in business, advertising, and public relations, as well as its use in political movements and the development of communities. **Co-requisite:** ENGL 210.		

CMNS 401	Peace Communication: Media and Conflict Resolution	3(3,0)
This course integrates methods, perspectives and concepts of Peace Studies, Culture Communication and Peace Journalism to explain contemporary debates in the global public sphere. It considers how cultural stereotypes about ideology, religion and culture frame Arabs and Americans in the mass media. RHU students will engage with students from collaborating universities in the United States in online, asynchronous conversation and participate in shared projects that explore the role of the media in influencing Arab and American relations. **Co-requisite:** ENGL 210.		

CMNS 410	Public Speaking	3(3,0)
This course is designed to provide both a practical introduction to the fundamental principles of public speaking and a forum for practicing public speaking skills. Through a variety of instructional strategies (discussion, class workshops, readings, lectures, and presentations), students will learn the processes by which effective speeches are conceived, prepared, and delivered. **Co-requisite:** ENGL 210.		

EDUC 210	Educational Psychology	3(3,0)
This course draws on the study of psychological principles, cognitive development, and learning theories applicable to teaching/learning situations. Focus areas include human growth and development, with a specific focus on adolescent development and developmentally appropriate practices, learning theory, motivation theory, instructional and college practices, individual differences, student interpersonal and group behavior, classroom management and organization. **Co-requisite:** ENGL 210.		

EDUC 351	Behavior Management and Motivation for Special Learners	3(3,0)
This course provides students with practice in applying the techniques of behavioral psychology to modify the behavior of and motivate students with special needs. It also addresses the limits of behavior modification. **Co-requisite:** ENGL 210.		

EDUC 415	Factors in Student Motivation	3(3,0)
This course will examine motivational factors which influence children's learning. Topics include attribution theory, teacher influences (expectancy effects), learning structures (competitive vs. cooperative learning), family influences (the socialization of achievement), cultural influences (how cultural background impacts on college performance), and individual differences (intrinsic motivation and sex differences in learning). **Co-requisite:** ENGL 210.		

EDUC 480	Special Topics in Education	3(3,0)
This course provides students with advanced study on selected topics or emerging issues in the Arab or international education. It is designed in a variety of activities like seminar format, multi-media presentation, experiential learning activities, interactive assignments, and cooperative group work. **Prerequisite**: EDUC 201 or consent of advisor.		

JRSM 210	Arabic News Writing & Reporting	3(3,0)
This course emphasizes defining news and its importance in a democratic society; the news-gathering process; the elements of news; introduction to basic news reporting and writing for print and broadcast; use of the Internet as a reporting and research tool; accuracy and fairness as journalistic imperatives. Outside community research and reporting time is required. **Co-requisite:** ENGL 210.		

JRSM 240	Media and Public Relations Writing	3(3,0)
This introductory-level course is designed to help students learn the formats and conventions of media and public relations writing, including newspapers, magazines, web and interactive media, advertising copy, public relations writing and social media. It also addresses ethical issues related to writing in these fields. **Co-requisite:** ENGL 210.		

JRSM 300	Mass Media Essentials	3(3,0)
This course familiarizes students with concepts and terminology used in various fields of communication and helps them understand the development of mass communication in political, economic, social, and cultural contexts. **Co-requisite:** ENGL 210.		

JRSM 310	Advanced Arabic News Writing and Reporting	3(3,0)
The aim of this course is to provide students with theory and development of news stories, with special emphasis on interviewing, observation, document research, source development, and other standard reporting techniques. Students cover community beats and report and write news stories from those beats, primarily in public affairs reporting. **Co-requisite:** ENGL 210.		

JRSM 320	Media and Society	3(3,0)
This course examines the relationship between the media and society, considering how each impacts the other. Students will be introduced to various theories that consider this relationship and its implications. **Co-requisite:** ENGL 210.		

JRSM 380	Arab and International Media	3(3,0)
This course offers students a comparative survey of international media, examining the basic principles and concepts of news and the media that developed in the West, as applied in primarily Arab countries. **Co-requisite**: ENGL 210.		

POSC 301	Introduction to Political Science	3(3,0)
This course aims at familiarizing students with the basic concepts and disciplines in the study of political science. It focuses on the nature of politics as a science, political ideologies, the state and state-society relations, political parties, electoral systems, democracy, and international organizations. A significant emphasis is placed on the ability of students to utilize these concepts in the analysis of current political issues, disputes, and trends. The course combines lectures and class discussions, debates, and presentations. **Co-requisite**: ENGL 210.		

PSYC 301	Introduction to Psychology	3(3,0)
This course is an introduction to the theories, concepts, and viewpoints that comprise the discipline of psychology. The course is directed toward the understanding of human behavior by dealing with such topics as history of psychology, learning, personality, behavior, motivation, perception, and social psychology, mental health as well as other areas. **Co-requisite**: ENGL 210.		

PSYC 302	Social Psychology	3(3,0)
This course is a study of the dynamics and effects of social influences on individual human behavior. In this course, students will explore such topics as attitude changes, social beliefs, roles, conformity to group processes, and prejudices with special attention given to the Middle Eastern perspective. **Co-requisite**: ENGL 210.		

PSYC 303	Psychology of Personality	3(3,0)
This course presents the theories of personality including psychoanalytic, behaviorist, humanist, and others, while considering different factors that shape personality and behavior. The study includes methods of assessing personality. **Co-requisite**: ENGL 210.		

PSYC 304	Child Psychology	3(3,0)
This course will introduce students to the psychological development of children from conception to adolescence (with a focus on infancy through middle childhood). Topics including perceptual, cognitive, personality and social development focus on age-related issues and events that might affect someone across various age levels. **Co-requisite**: ENGL 210.		

PSYC 306	Psychology of Women	3(3,0)
This course examines the biological, sociological, and cultural influences on the psychology of women. It includes such topics as gender stereotypes, the development of gender roles, gender comparisons, women and work, love relations, women's physical and mental health, violence against women, and women in later adulthood. **Co-requisite**: ENGL 210.		

PSYC 310	Positive Psychology	3(3,0)
This course examines scientific research on happiness and its practical application in three main areas: positive emotions, positive individual traits and positive institutions.		

This course also presents practical ways to promote and maintain a sense of well-being and happiness in all aspects of one's life. **Co-requisite**: ENGL 210.

PSYC 312	**Children and War**	**3(3,0)**
This course is intended to help students be aware of the consequences of war and conflicts on the mental health and well-being of children. The course will examine a variety of effects, emphasizing posttraumatic stress disorder (PTSD) and other psychological conditions that result from war. The course will empower the students with the techniques of working with children affected by war. **Co-requisite**: ENGL 210.		

PSYC 313	**Adolescent Psychology**	**3(3,0)**
This course is designed as a foundation for understanding the physical, cognitive, social, and moral development of adolescents in the contexts of family, peers, school, work, and the media. It discusses major theories, methods of studying adolescents, adolescent development, and contemporary adolescent issues and concerns. **Co-requisite**: ENGL 210.		

PSYC 400	**Conflict Transformation**	**3(3,0)**
This course explores practical theories for understanding congregational conflict, as well as various perspectives on conflict transformation. Students will engage in reflection on their own styles of dealing with conflict and learn new ways of responding. They will explore practices of dialogue and mediation for addressing conflict interpersonal, small group and congregational settings with the goal of developing an approach to addressing inevitable situations of difference, change and conflict in a variety of situations. **Co-requisite**: ENGL 210.		

PSYC 401	**Emotional Intelligence**	**3(3,0)**
Intelligence quotient (IQ) gets you hired but emotional quotient (EQ) gets you promoted". This course explores basic concepts of emotional intelligence and the application of emotional intelligence to education, the workplace, and personal psychological adjustment. It will offer useful lessons with the help of practical exercises, games, audio-visual instruments, case studies, classroom interaction to show the road map how to foster emotional intelligence in the college and office for achieving health, happiness and optimal performance at work. **Co-requisite:** ENGL 210.		

PSYC 410	**Abnormal Psychology**	**3(3,0)**
An introduction to the theories of abnormal behaviors, including addiction and substance abuse, bipolar disorder, eating disorders, depression, obsessive-compulsive behaviors, phobias, schizophrenia, and sexual disorders. Students will consider theoretical implications of and treatments for a range of abnormal behavior. **Co-requisite**: ENGL 210.		

PSYC 480	Special Topics in Psychology	3(3,0)
This course provides an in-depth look into selected issues related to psychology and individuals. Through readings, research, discussion, and guest lectures current issues related to psychology are thoroughly explored. **Prerequisite**: Consent of the instructor.		

SOCI 210	Research Methods in the Social Sciences	3(3,0)
This course is designed for students majoring in psychology, sociology, communications, and other social sciences fields. It introduces them to advanced research design and methodology, including statistical analysis. **Prerequisite**: MATH 220.		

SOCI 301	Introduction to Sociology	3(3,0)
This course explores a variety of sociological theories and approaches to understanding society. The student will learn about human social life, groups, and societies and will be helped to detect the social influences that shape our lives. The approach used in this course is a self-exploratory process that develops individual and social awareness. A secondary objective is discussing methods common to sociology, conflict theory, symbolic interactionism, and feminism. **Co-requisite**: ENGL 210.		

SOCI 302	Political Sociology	3(3,0)
This course tackles the social issues pertaining to the historical and contemporary evolution of various political ideologies. It aims at developing students' understanding of the social bases of politics and political ideologies along with the recent changes in the socio-political world. Different economic and political philosophies are considered and their effects on the fate of nations and their citizens detected. **Co-requisite**: ENGL 210.		

SOCI 304	Introduction to Educational Sociology	3(3,0)
This course introduces the study of sociological concepts as they apply to the institution of education. Students will examine issues of race, class, status, poverty, and bureaucracy in the educational setting. They will also examine current perspectives and research about the social aspects of the learning process. **Co-requisite**: ENGL 210.		

SOCI 310	Intercultural Communication	3(3,0)
This course deals with cultural issues like cultural awareness, enculturation, acculturation, and cultural shocks. It involves hands-on activities to promote cultural awareness and equip students with skills for dealing with people from diverse cultural backgrounds. It includes team-oriented research and presentation that reflects all the cultural aspects and some minute details of the culture that they choose to work on. **Co-requisite**: ENGL 210.		

SOCI 313	Interpersonal Communication	3(3,0)
Students in this course examine communication theory and case studies to gain insight into the factors that affect human communications. It aims to improve students'		

communication skills and equip them with techniques that will enhance the quality of their relationships. The course also offers strategies for managing interpersonal conflicts. **Co-requisite**: ENGL 210.

SOCI 340	**Arab Culture and Society**	**3(3,0)**
This course examines contemporary Arab society, considering its social structures and groups, cultural patterns, and other aspects of the society. Students consider current issues related to Arab culture and society. **Co-requisite** ENGL 210.		

SOCI 410	**Culture and Identity**	**3(3,0)**
This course analyzes the role of culture in an individual's sense of identity, with an emphasis on how it manifests in the Middle East. **Co-requisite** ENGL 210.		

SOCI 420	**Social Inequalities**	**3(3,0)**
The course addresses issues such as class, status, and gender inequalities, examining how they affect individuals and society. **Co-requisite** ENGL 210.		

SOCI 480	**Special Topics in Sociology**	**3(3,0)**
This senior course provides an in-depth look into selected issues related to sociology and society. Through readings, research, discussion and guest lecturers, current issues related to sociology are thoroughly explored. **Prerequisite**: Consent of the instructor.		

Natural Science and Technology Electives

Descriptions of elective courses that may be chosen to satisfy the Natural Sciences domain are given below.

BIOL 210	**Human Anatomy and Physiology and Lab**	**3(2, 2)**
A general overview that deals with cell structure and function and physiology, anatomy, and physiology of the human body systems. These include cardiovascular, central nervous, respiratory, urinary, digestive, immune, and musculoskeletal systems. The course also offers a set of experiments that deal with basic biological processes and advanced biological assessments. **Prerequisite**: None.		

BIOL 211	**General Biology**	**3(3,0)**
Topics covered are small/large molecules, organization of the cell, membranes, energy, enzymes and catalysts, basic cell functions, biological control systems.		

BIOL 222	**Introduction to Food Safety and Lab**	**3(2, 2)**
This course aims to provide instruction in the general principles of food microbiology and food safety. It covers the biology and epidemiology of foodborne microorganisms of public health significance, including bacteria, fungi, protozoa and viruses, and food spoilage microorganisms; chemical pollution of food stuffs; safety and preservation of food commodities; Principal methods for examination of foods; food quality control and implementation of Hazard Analysis Critical Control Point (HACCP) scheme. The course		

also offers a set of experiments to deal with the laboratory methods used in the microbiological analysis of foods, and with the identifying characteristics of the major groups of microorganisms associated with food spoilage, foodborne disease, and food fermentations. **Prerequisite**: None.

BITM 300	**Business IT Management**	**3(3,0)**
This course provides a comprehensive introduction to information systems and their application. It explains how to use and manage information technologies to revitalize business processes, conduct electronic commerce, improve business decision-making, and gain competitive advantage. **Prerequisite**: BITM 200		

CHEM 210	**Principles of Chemistry**	**3(3,0)**
This course emphasizes the fundamental principles of chemistry including stressing atomic structure, bonding, stoichiometry, gases, solutions, acids and bases, solution equilibria. **Prerequisite**: None.		

CHEM 211	**Environmental Chemistry and Lab**	**3(2,2)**
This course provides an opportunity to develop an understanding of several basic environmental functions, the complicated nature of environmental systems, and the need for multidisciplinary solutions to environmental problems. Topics covered include the hydrosphere, water quantity and quality, soil and the soil ecosystem, biological resources, waste disposal, air pollution, ozone depletion, acid rain, global warming. The course also includes a set of experiments that offer students practical experience in different environmental analysis settings including air and water quality. **Prerequisite**: None.		

COSC 214	**Introduction to Programming**	**3(3,0)**
This course presents the fundamentals of structured and modular programming concepts. It covers primitive data types, expressions, control statements, functions, arrays, basic searching/sorting algorithms, and introduction to pointers. **Prerequisite**: None. Equivalent to CCEE 214.		

EDUC 317	**Neurological Development and Cognitive Change**	**3(3,0)**
This course provides a unified view of neurological development beginning with the growth of the first neural cells and extending through the emergence of complex thought and behavior. It considers brain mechanisms underlying cognitive, perceptual, social, and emotional development during infancy and childhood.		

EDUC 222	**Computer Applications in Education**	**3(3,0)**
This course focuses on general knowledge about the use of microcomputers in education, including the use of common computer applications such as word processing, spreadsheet, database, and presentation software in teaching/learning activities; as well as evaluating the effectiveness of educational software in teaching/learning in various subject matter areas		

GEOL 300	Human Geography: People and Culture	3(3,0)
Different cultures in different landscapes are compared to the Middle East. This course examines the many issues of human population, perception of the environment, diffusion of ideas, and cultural aspects of resources and urban growth. **Co-requisite**: ENGL 210.		

PHYS 211	Physics: Electricity and Magnetism and Lab	3(3,1)
This course covers fundamental topics in Electricity and Magnetism: Electric forces and Electric Fields for discrete and continuous charge distribution, Gauss's Law, Electric Potential, Capacitance and Dielectrics, Kirchhoff's rules, Magnetic Fields and Forces, Biot-Savart Law, Ampere's Law, Magnetic Flux and Gauss's Law in Magnetism. It also includes a laboratory component that introduces students to the "real world" by offering a set of experiments in electricity and magnetism. **Prerequisite**: None.		

PHYS 312	Modern Physics	3(3,0)
This course introduces the principles of revolutionary developments of the 20th century. It covers interaction of light and matter (Photoelectric effect, Compton, Auger, etc.), the dual nature of light, various models of atomic description, quantum numbers, relativistic approach, Heisenberg Uncertainty Principle, Schrodinger Equation, and an introduction to the band theory of solids and to particle physics.		

Quantitative Reasoning Electives

BADM 250	Business Statistics	3(3,0)
Business Statistics introduces students to the fundamentals of applied statistics. Accordingly, students are exposed to the concepts of statistics as they are directly applied in solving business problems. The course will cover random variables, sampling, probability distributions, expectation, hypothesis testing and confidence intervals, analysis of variance, correlation, and simple linear regression.		

BADM 420	Quantitative Methods for Business	3(3,0)
This course introduces students to managerial decision analysis using quantitative tools. The course will introduce students to the practice of using and building mathematical models that would help managers make informed decisions. Focus is on the applied aspects of statistics and math. As such, the course will cover the basics of probabilistic and statistical techniques, decision analysis, linear programming, optimization, forecasting, and waiting-line theory. **Prerequisite:** BADM 250 or MATH 351.		

ENGR 300	Engineering Economics and Management	3(3,0)
Concepts and techniques in basic Engineering economy principles and applications. Interest and financial mathematics; present worth, annual worth, benefit/cost ratio, internal rate of return, multiple alternatives, income tax, inflation, Risk analysis, Investment and investment choice, equivalence, loans, cost of capital, retirement and		

replacement, sector analysis and viewpoint, sensitivity analysis, accounting, and financial statements.

GRDS 220	Introduction to Digital Media	3(3,0)
In this course, students will develop a solid foundation of Adobe Illustrator and Adobe Photoshop tools and techniques. Students will learn the difference between vector based and pixel-based programs and how to integrate both work fields to produce creative graphics. Moreover, students will receive a brief introduction about Adobe InDesign: workspace, function and tools.		

GRDS 335	Production	3(3,0)
In this course, students will develop an understanding of the “process flow” in contemporary methods of print production. The course covers the entire timeline of production: Prepress-Press-Post Press. In addition to printing technologies, students will learn about various types of ink and paper, binding, varnishes, finishing techniques and the effect of the printing process on the product. Students will also learn how to handle projects and deal with clients as freelance designers or as designers working for companies. Prerequisite: GRDS 222.		

MATH 210	Discrete Mathematics	3(3,0)
Logic, propositional equivalences, predicates and quantifiers, methods of proof, proof strategy, mathematical induction, recursive definitions, and structural induction, sets and set operations, functions, growth of functions, basics of counting, permutations and combinations, Binomial theorem, relations, and their properties, representing relations, equivalence relations, introduction to graphs, graph terminology, introduction to trees.		

MATH 220	Statistics for Social & Behavioral Sciences	3(3,0)
This course introduces statistical techniques used in the analysis of social science research data. Topics include frequency distribution, central tendency, variability, probability theory, Bayes’ rule, mathematical expectation, variance and covariance, binomial, Poisson, hypergeometric and normal distributions, sampling distributions, estimation problems and hypothesis testing. **Prerequisite**: None.		

MATH 351	Probability and Statistics	3(3,0)
Probability and conditional probability, Discrete and continuous random variables, marginal distributions, expectation, variance-mean-median-covariance and correlation, conditional expectation, binomial, multinomial and Poisson distributions, Normal distribution, Sampling distribution, Prediction and confidence intervals, Hypothesis testing. **Prerequisite**: MATH 211.		

PHIL 302	Introduction to Formal Logic	3(3,0)
This course is a standard introduction to the formal techniques of argument analysis. Formal logic was invented to mirror and evaluate mathematical reasoning; however, this course will concentrate on the relationship between formal logic and everyday reasoning and consequently language usage in general. **Co-requisite**: ENGL 210.		

Community and Sustainability Electives

BADM 215	Personal Development and Management	1(1,0)
This course engages the student in a series of self-reflection and self-discovery activities and lectures. It is intended to encourage students to develop themselves and plan for the present and the future by becoming more self-aware. Topics and issues include personality types, communication styles, personal performance factors, career choices, and personal development planning.		

BADM 290	Community Engagement Experience	0(0,1)
The Community Engagement experience is a specific number of hours of volunteering by students at community organizations under the supervision of a faculty member. Community organizations may include governmental agencies, non-governmental organizations, and civil society organizations.		

EDUC 315	Children's Health and Safety in the School Environment	3(3,0)
This course introduces students to all types of childcare facilities and environmental health concepts as they pertain to children's health and wellbeing. It examines current policies and practices of environmental health. It covers indoor and outdoor safety concerns, safe food handling, Universal Precautions, and other aspects of disease prevention, as well as the recognition and reporting of child abuse. It includes specific strategies to strengthen families to reduce the risk of child abuse and neglect. **Co-requisite** ENGL 210.		

EDUC 480	Special Topics in Education	3(3,0)
This course provides students with advanced study on selected topics or emerging issues in the Arab or international education. It is designed in a variety of activities like seminar format, multi-media presentation, experiential learning activities, interactive assignments, and cooperative group work. **Prerequisite**: EDUC 201 or consent of advisor.		

ENVS 201	Introduction to Environmental Science	3(3,0)
The main goal of the Introduction to Environmental Science (ENVS201) course is to provide students (except engineering) with the scientific principles and concepts required to understand the interrelationships of the natural world; to identify and analyze environmental problems both natural and Man-made; to evaluate the relative risks associated with these problems; and to examine alternative solutions for resolving and/or preventing environmental problems. **Prerequisite**: None.		

GRDS 440	Design and Social Impact	3(3,0)
This course prepares students to become leading agents of social change through community engagement. It aims at promoting collaborative work between computer science and graphic design students to design effective solutions to existent community issues. The course is structured on a balance between classroom theory learning,		

extensive field research and implementation of a real-world solution using both expertise. **Prerequisite:** Junior Standing.

INDS 335	**Design Issues and Sustainability**	**3(3,0)**
This course investigates theoretical and philosophical constructs and design issues related to the study of interior architecture and design. It focuses on the examination of the philosophical and practical principles of sustainable design through exploration of environmental issues, sustainable materials and methods, and professional practice. Students will develop awareness of the implications of design decisions upon the environment and will gain a foundation for evaluation of materials, processes, and practices according to the principles of sustainable and environmentally responsible design.		

PSYC 314	**Psychology for Sustainability**	**3(3,0)**
This course will take a holistic approach to the topic from most major areas of psychology to explore the study of environmental sustainability from a psychological perspective. We will use psychological principles, theories, and methods to examine the reciprocal relationship between human beings and the natural world, discuss the complex nature of environmental problems and review important psychological and social factors that underlie a range of sustainable and non-sustainable behaviors. **Co-requisite**: ENGL 210.		

College of Arts and Sciences

COLLEGE OF ARTS AND SCIENCES (CAS)

College Officers

Hiam Loutfi	Interim President
Hiam Loutfi	Acting Vice President for Academic Affairs
Mahmoud Halablab	Dean

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History and Overview

RHU's College of Arts and Sciences (CAS) aims to help meet the growing need in Lebanon for education, language, media, computer science, math, and design fields. The College aims to graduate 21st century professionals who can serve effectively in their fields and make a significant difference in their communities. The College of Arts and Sciences graduates have opportunities to play key roles in advancing the civil society and raising civic awareness. The CAS will develop students' leadership skills, so they truly make a difference in the greater community.

The College of Arts and Sciences faculty is active in research in their varied fields. At the same time, they have hands-on professional experience that they bring into the classroom. The College of Arts and Sciences faculty's many publications include books, academic journal articles, conference papers, magazine and newspaper articles, broadcast media scripts and more.

Vision

The College of Arts and Sciences (CAS) aims to provide excellent educational standards, purposeful research, and interdisciplinary investigation into present and future problems facing humanity in Lebanon, MENA region and the World.

Mission

As educators committed to Rafik Hariri University, our mission in the College of Arts and Sciences is to provide students with a holistic integrated education in arts, English, humanities, social sciences, design, and computing disciplines. We are dedicated to excellence in teaching, scholarly work, academic quality, professional programs,

technological innovations, and friendly faculty-student relationship. We prepare our graduates to be highly productive in their prospective careers.

Core Values

The College of Arts and Sciences is committed to acting in accordance with the following guiding values:

Professional Excellence
We, faculty, and students alike, strive to consistently do our utmost to reach high standards of excellence in our performance.

Collaboration
We value each other's unique perspectives and benefit from them by engaging together in an atmosphere of mutual respect. We share expertise, resources, and time with each other to pursue common goals.

Integrity
We are committed to open, transparent decision-making in all processes in the College of Arts and Sciences and insist on treating every faculty, staff member and student with fairness and compassion.

Celebration
We recognize, appreciate, and celebrate the achievements of all College of Arts and Sciences members (faculty, students, and staff).

Compassion
We are concerned about the whole person and his or her wellbeing, whether it is someone within our college or in the greater community. That concern translates into actions of compassion towards individuals and the larger community.

Innovative Teaching
We engage faculty and students in innovative educational teaching methodologies, including the effective use of technology in education.

Learning Objectives

Students in the College of Arts and Sciences will:

Develop professional background and skills in their chosen fields.
Students will become proficient in both theory and application relevant to their majors and learn to pursue research in their chosen fields.

Integrate academic learning with experiences in the community.
Students will apply their learning in work-place experiences to confidently enter their professions upon graduation.

Value and practice reflective thinking
Students will engage in reflective, critical, and independent thinking.

Develop communication skills
Students will engage in classes that emphasize oral and written communication skills.

Develop personal values
Programs and activities in the College will provide opportunities for students to develop their personal values through engaging with social issues in the community.

Develop digital media literacy
Students will develop the ability to "read" and "write" in today's media, which is a key skill for all 21st century citizens.

Academic Programs

The College of Arts and Sciences offers three undergraduate programs leading to a Bachelor of Arts (BA) degree and five undergraduate programs leading to a Bachelor of Science (BS) degree. It also offers the Intensive Language Program, the English Support Center, and core education courses to all RHU students. The programs are as follows:

1. Bachelor of Arts in English Language
2. Bachelor of Science in Computer Science (ABET Accredited)
3. Bachelor of Science in Healthcare Information Systems
4. Bachelor of Science in Graphic Design
5. Minors in Computer Science, Graphic Design, Mathematics, and Psychology

Program Codes

The following table lists the code used for each program. This code is used as the prefix of each course designation in the program.

Program Code	Program
EDUC	Education
ENGL	English Language
COSC	Computer Science
HCIS	Healthcare Information Systems
MATH	Mathematics
GRDS	Graphic Design

Admission Requirements

Students wishing to enter the College of Arts and Sciences must fulfill the University admission requirements. Students aspiring to major in English language must attain a minimum score of 550 on their English placement test. Students aspiring to study a major in the Design Department are required to take an aptitude test to get accepted into the major. Students are strongly advised to carefully review the University Catalog for admission and degree requirements as well as all related academic policies.

Graduation Requirements

Each College of Arts and Sciences program grants students a bachelor's degree. The BA program encompasses 93 credits for Education, 93 credits for English Language, and 93 credits for Journalism – Media and Digital Communication. The BS program encompasses 94 credits for Computer Science, 100 credits for Healthcare Information Systems, 91 credits for Mathematics, 111 credits for Graphic Design, and 111 credits for Interior Design. The credit hour allocations for each program are shown in the following tables:

BA in Education (93 credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	6	-	9	15	30	32
College Requirements	-	-	9	-	9	10
Program Requirements	54	-	-	-	54	58
Credits	60		33		93	100

BA in English Language (93 credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	9	-	6	15	30	32
College Requirements	-	-	9		9	10
Program Requirements	27	18	3	6	54	58
Credits	54		39		93	100

BA in Journalism—Media and Digital Communication (93 credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	-	-	15	15	30	32
College Requirements	-	-	9	-	9	10
Program Requirements	27	9	15	3	54	58
Credits	36		69		93	100

BS in Computer Science (94 credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	6	–	15	9	30	32
College Requirements	-	–	–	–	-	0
Program Requirements	36	9	19	–	64	68
Credits	42	9	34	9	94	100

BS in Healthcare Information Systems (100 credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	9	-	12	9	30	30
College Requirements	-	-	-	-	-	-
Program Requirements	42	9	19	-	70	70
Credits	51	9	31	9	100	100

BS in Graphic Design (111 credits)						
Courses Category	Major		Non-Major		Credits	Percen t
	Mandatory	Electives	Mandatory	Electives		
General Education	12	-	9	9	30	27
College Requirements	-	-	-	-	-	-
Program Requirements	51	6	21	3	81	73
Credits	63	6	30	12	111	100

BS in Interior Design (111 credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	9	-	12	9	30	27
College Requirements	-	-	-	-	-	0

Program Requirements	51	6	21	3	81	73
Credits	60	6	33	12	111	100

BS in Mathematics (91 credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	3-	–	18	9	30	33
College Requirements	–	–	–	–	–	0
Program Requirements	55	3	–	3	61	67
Credits	58	3	18	12	91	100

A student in any of the CAS programs is eligible for graduation if s/he has:

1) Completed all the requirements of the degree
2) Attained a cumulative GPA of 70 or higher
3) Attained a major GPA of 70 or higher
4) Attained at least a 70 grade on the summative learning project/ senior project
5) Successfully completed the mandatory Co-op training program.

I. University Requirements (General Education)

Every RHU student must take 30 – 33 credit hours of general education courses distributed over six domains as described below. Twenty-one mandatory credits are selected from domains 1, 4, 5 and 6 and 9-12 elective credit hours selected from domains 2 and 3.

Domain		Credits	Courses
1	Communication Competency*	9	ENGL 210: English Composition and Rhetoric ENGL 217: Professional English Communication ARAB 212**:** Arabic Language and Communication CMNS 200: Etiquette
2	Humanities/Fine Arts	3-6	Selected from an approved list
3	Social Sciences/Culture	6	Selected from an approved list
4	Natural Sciences and Technology	6	Selected from an approved list
5	Quantitative Reasoning	3	Selected from an approved list
6	Community and Sustainability	3	Selected from an approved list

* Refer to the introductory section of the college of interest for description of courses specific to domains 1, 4, 5 and 6.

Descriptions of the mandatory general education courses are given below:

BITM 200	**Information Technology Essentials**	**3(3,0)**
This course is an intro to MS-Office products (Word, Excel, PPT, and ACCESS), Web page design and server upload, Internet use, and how PCs work.		

CMNS 355	**Digital Media Literacy**	**3(3,0)**
The class aims to produce media literate students who successfully use media to voice their ideas, become better citizens, and engage in social, political, and cultural change. It focuses on how media communicate meanings that influence our perceptions of reality, including ourselves, society, politics, and culture. It teaches students to effectively use critical thinking to deconstruct media messages, analyze and interpret intent, and generate constructive responses. It provides students with the essential new media production skills and knowledge needed to create digital media messages including digital design, photo manipulation, video/audio production, blogging, podcasts, and screen casting skills.		

EDUC 222	**Computer Applications in Education**	**3(3,0)**
This course focuses on general knowledge about the use of microcomputers in education, including the use of common computer applications such as word processing, spreadsheet, database, and presentation software in teaching/learning activities; as well as evaluating the effectiveness of educational software in teaching/learning in various subject matter areas		

EDUC 480	**Special Topics in Education**	**3(3,0)**
This course provides students with advanced study on selected topics or emerging issues in the Arab or international education. It is designed in a variety of activities like seminar format, multi-media presentation, experiential learning activities, interactive assignments, and cooperative group work. **Prerequisite**: EDUC 201 or consent of advisor.		

ENGL 210	**English Composition and Rhetoric**	**3(3,0)**
This course reviews the fundamentals of good academic writing in English, teaches essay writing essentials and research skills in two rhetorical modes (persuasion and argumentation), and provides practice in writing essays in these modes, research paper, and oral presentation. **Prerequisite:** ENGL 101 or TOEFL 550+ (paper) or 80+ (computer).		

ENGL 217	**Professional English Communication**	**3(3,0)**
This is a required course designed to help students develop effective professional communication skills, both orally and in writing. In this course, students learn how to write emails, memos, letters, proposals, reports, and other forms of employment correspondence. In addition, this course helps students sharpen their presentation		

skills. Broadly, this course enables students to behave professionally and effectively in their prospective jobs. **Prerequisite**: ENGL 210.

ENGL 420	Literature and Culture	3(3,0)
A course that considers major works of literature, specifically in the context of twentieth-century cultural theory, including Marxism, post colonialism, national literatures, ethnic writings, and feminist theory. The primary intention of this course is to explore how various texts interact with their societies, or how those societies are influential in the construction of literary works. **Prerequisite**: Consent of the instructor.		

GRDS 220	Introduction to Digital Media	3(3,0)
In this course, students will develop a solid foundation of Adobe Illustrator and Adobe Photoshop tools and techniques. Students will learn the difference between vector based and pixel-based programs and how to integrate both work fields to produce creative graphics. Moreover, students will receive a brief introduction about Adobe InDesign: workspace, function, and tools.		

GRDS 335	Production	3(3,0)
In this course, students will develop an understanding of the “process flow” in contemporary methods of print production. The course covers the entire timeline of production: Prepress-Press-Post Press. In addition to printing technologies, students will learn about various types of ink and paper, binding, varnishes, finishing techniques and the effect of the printing process on the product. Students will also learn how to handle projects and deal with clients as freelance designers or as designers working for companies. **Prerequisite**: GRDS 222.		

GRDS 360	Visual Perception & Infographics	3(3,0)
Visual perception is the ability to interpret information from our surroundings through visible light that reaches the eye. This course will explore the various theories of visual perception with an emphasis on Gestalt theory and its relation to Graphic Design. It will create an understanding of our human visual perception and its limitations. Students will also be given projects in which they will apply Gestalt principles and the learned theories. In addition to visual perception theories, students will learn 2 key disciplines in design: Infographics and Wayfinding. **Prerequisite**: GRDS 311.		

GRDS 440	Design and Social Impact	3(3,0)
This course prepares students to become leading agents of social change through community engagement. It aims at promoting collaborative work between computer science and graphic design students to design effective solutions to existent community issues. The course is structured on a balance between classroom theory learning, extensive field research and implementation of a real-world solution using both expertise. **Prerequisites:** Junior Standing.		

HCIS 201	Environmental Health	3(3, 0)

This course is designed to provide students with an introduction to the key areas of environmental health. Using the perspectives of the population and community, the course will cover factors associated with the development of environmental health problems. **Prerequisite***:* None*.*

INDS 220	**Computer Design I**	**3(3,0)**
This course is an introduction to the principles and uses of computer-aided drafting and design using the most recent version of the AutoCAD software. Students will acquire the technical skills needed to draft 2D architectural plans, sections, elevations, and details. In addition, students will learn computer-rendering techniques using Adobe Photoshop.		

INDS 325	**Lighting & Mechanics**	**3(3,0)**
This course is a comprehensive study of the principles and theories of both lighting systems and mechanics. Students will learn about the applications of lighting design, lighting specifications, in-depth lighting mathematical calculations, available equipment and fixtures and aesthetic considerations needed to complete installation. Additionally, students will become familiar with different types of heating, ventilation, Ac systems, their installation, design considerations and needs, in addition to plumbing and sanitary systems. **Prerequisite**: INDS 315.		

INDS 335	**Design Issues and Sustainability**	**3(3,0)**
This course investigates theoretical and philosophical constructs and design issues related to the study of interior architecture and design. It focuses on the examination of the philosophical and practical principles of sustainable design through exploration of environmental issues, sustainable materials and methods, and professional practice. Students will develop awareness of the implications of design decisions upon the environment and will gain a foundation for evaluation of materials, processes, and practices according to the principles of sustainable and environmentally responsible design.		

MATH 207	**College Algebra**	**3(3,0)**
Solving linear and non-linear equations, modeling with equations, functions, and their graphs, increasing and decreasing functions-transformation, quadratic functions-maxima and minima, modeling with functions, combining functions, polynomial functions and their graphs, dividing polynomials, real zeros of polynomials, complex numbers, complex zeros of polynomials, exponential and logarithmic functions, sequences and summation notation-arithmetic sequences, counting and probability.		

MATH 220	**Statistics for Social & Behavioral Sciences**	**3(3,0)**
This course introduces statistical techniques used in the analysis of social science research data. Topics include frequency distribution, central tendency, variability, probability theory, Bayes' rule, mathematical expectation, variance and covariance, binomial, Poisson, hypergeometric and normal distributions, sampling distributions, estimation problems and hypothesis testing. **Prerequisite**: None.		

MATH 351	Probability and Statistics	3(3,0)
Probability and conditional probability, Discrete and continuous random variables, marginal distributions, expectation, variance-mean-median-covariance and correlation, conditional expectation, binomial, multinomial and Poisson distributions, Normal distribution, Sampling distribution, Prediction and confidence intervals, Hypothesis testing. **Prerequisite**: MATH 211.		

PHYS 211	Physics: Electricity and Magnetism and Lab	3(3,1)
This course covers fundamental topics in Electricity and Magnetism: Electric forces and Electric Fields for discrete and continuous charge distribution, Gauss's Law, Electric Potential, Capacitance and Dielectrics, Kirchhoff's rules, Magnetic Fields and Forces, Biot-Savart Law, Ampere's Law, Magnetic Flux and Gauss's Law in Magnetism. It also includes a laboratory component that introduces students to the "real world" by offering a set of experiments in electricity and magnetism. **Prerequisite**: None.		

PHYS 312	Modern Physics	3(3,0)
This course introduces the principles of revolutionary developments of the 20th century. It covers interaction of light and matter (Photoelectric effect, Compton, Auger, etc.), the dual nature of light, various models of atomic description, quantum numbers, relativistic approach, Heisenberg Uncertainty Principle, Schrodinger Equation, and an introduction to the band theory of solids and to particle physics.		

II. College Requirements

A. Remedial Courses

Proficiency in the English Language is a requirement for admission to any program in the College of Arts and Sciences. Students who do not meet the University English proficiency admission requirements may gain admission through the Intensive English Program in which they can develop their English proficiency. In addition, incoming students to either the Computer Science, Healthcare Information Systems, and Mathematics programs must pass the placement exam in mathematics. Those who fail the mathematics placement exam and obtain a low score are required to take one or two remedial Mathematics course(s) prior to taking program level calculus courses. The possible remedial courses are:

- MATH 190 - Calculus I
- MATH 191 – Calculus II

These remedial courses do not count toward fulfilling the degree requirements. Description of the remedial courses follows.

MATH 190	Calculus I	3(3,0)

Functions and their graphs, limits and continuity, differentiation, applications of derivatives, Extreme values and mean value theorem, definite and indefinite integrals, the substitution method.

MATH 191	**Calculus II**	**3(3,0)**
Inverse trigonometric functions, integration techniques, parameterizations and parametric curves, vectors and dot and cross products, Lines and planes in space, curves in space, curvature, and normal vectors of a curve. **Prerequisite**: Math 190.		

B. Mandatory Courses

All students are required to take 9 credit hours of mandatory foundational courses. A list of these courses and their descriptions follows.

Course	Title	Credits	Prerequisite
ARAB 212	Arabic Language and Communication	2	
CMNS 200	Etiquette	1	Co-req.: ENGL 210
ENGL 210	English Composition and Rhetoric	3	
ENGL 217	Professional English Communication	3	

Descriptions of these courses are given below.

ARAB 212	**Arabic Language and Communication**	**2(2,0)**
This course helps students develop their ability to communicate effectively in standard Arabic. It provides students with the necessary communication skills in Arabic they might need in their future jobs. Specifically, students learn how to write and orally present different forms of workplace documents in Arabic.		

CMNS 200	**Etiquette**	**1(1,0)**
This course is designed to help students develop interpersonal and communication skills fundamental for success in the workplace no matter what industry, organization, or sector they are employed in. Students will improve their professional style as they study topics including polite conversation, personal appearance, office politics, diplomacy, telephone, cell phone, and voicemail etiquette, the protocol of meetings, job interview presentation and even international travel. Students will participate in an off-campus formal dining experience. **Co-requisite:** ENGL 210.		

ENGL 210	**English Composition and Rhetoric**	**3(3,0)**
This course reviews the fundamentals of good academic writing in English, teaches essay writing essentials and research skills in two rhetorical modes (persuasion and argumentation), and provides practice in writing essays in these modes, research paper, and oral presentation. **Prerequisite**: ENGL 101 or TOEFL 550+ (paper) or 80+ (computer).		

ENGL 217	**Professional English Communication**	**3(3,0)**

This is a required course designed to help students develop effective professional communication skills, both orally and in writing. In this course, students learn how to write emails, memos, letters, proposals, reports, and other forms of employment correspondence. In addition, this course helps students sharpen their presentation skills. Broadly, this course enables students to behave professionally and effectively in their prospective jobs. **Prerequisite**: ENGL 210.

III. Program Requirements

Requirements for the bachelor's degree are program specific. They encompass two categories: Major and non-major. Each category consists of a set of mandatory courses and a set of elective courses. The program requirements for the bachelor's degree in the different CAS majors are given hereafter. Details and titles of relevant courses are included in the Student's Study Plan (SSP) that every CAS student will have.

Course Coding

Each course offered by the College of Arts and Sciences is designated by a four-letter code representing the program or the elective categories followed by a three-digit number denoting the course number, for example, "**EDUC 301**."

The four-letter codes below refer to the respective course categories as follows:

ADPR: Advertising and Public Relations
ARAB: Arabic
CMNS: Communications
COSC: Computer Science
EDUC: Education
ENGL: English Language
GRDS: Graphic Design
HCIS: Healthcare Information Systems
HIST: History
IELP: Intensive English Language Program
INDS: Interior Design
JRSM: Journalism – Media and Digital Communication
MATH: Mathematics
POSC: Political Science
PSYC: Psychology
SOCI: Sociology

The first digit in the three-digit course number refers to the level of the course: **1** for freshman, **2** for sophomore, **3** for junior, **4** for senior and **5** for graduate.

The following example demonstrates the coding system: EDUC 201 is a sophomore level Education course.

The designation used to represent credit hours breakdown **c (t, p)** of a course is as follows: **"c"** the total credit hours**, "t"** stands for theoretical component of the course;

“p” practical or laboratory component. For example, 3(3, 0) represents a 3-credit-hour course with three contact lecture hours and zero laboratory hours.

Learning Support Centers

English Support Center

The English Support Center (ESC), located in I-107 with its allocated computer lab, provides support to all RHU community in English usage and proficiency development. Any student, faculty or staff member seeking assistance with English language and composition is encouraged to make an appointment with or drop by the English Support Center. Faculty members may also refer students with English language problems for individualized tutorials. It is staffed by RHU English faculty members.

Services include consultations on essay and research paper writing, presentations, CV and cover letter writing. In addition, skill practice, study skills, self-study materials for checkout, English as a Second Language lab practice, GMAT and GRE preparation and more are available. These services are provided free of charge to all RHU students, graduate and undergraduate, as well as faculty and staff. Students are encouraged to use these services to improve their English language skills.

Science Learning Support Center

RHU Science Learning Support Center (LSC), located in room I228, offers the students a peer-to-peer learning opportunity that complements classroom learning. The LSC aims to support students in advancing their knowledge and skills, reinforcing what they learn in the classrooms or overcoming learning and performance difficulties. In addition to being a focal-point for enquiry and two-way “asker-replier” learning, the LSC offers the space for academic interactions that can trigger enhanced learning.

The LSC is staffed by Teaching Assistants of graduate students and upper-level undergraduate students who are always available and ready to assist their fellow students in overcoming their academic challenges. Additionally, an “on-call” faculty member is assigned to ensure that the LSC is performing to the best interest of the students.

The center’s resources portfolio includes books, study guides, course materials, boards, computers, videos, DVD’s, documentaries, large screen LCD panels, and internet connected PCs.

LANGUAGES AND LIBERAL ARTS DEPARTMENT (LLA)

Faculty Members

Associate Professor:	Najwa Saba ‘Ayon Fares Mahmoud
Assistant Professor:	Grasiella Harb, Maysaa Banat
Lecturers	Dina Baba, Leen Srouji
Adjunct Faculty:	Kamal Nahas, Rola Danab, Naziha Shamseddine, Likaa Abou Hadir, Mona Al Chiek, Mirna Talhouk, Houda Arkadan.

Programs Offered

The Languages and Liberal Arts Department offers three undergraduate programs leading to a Bachelor of Arts (BA) degree and a minor in English Language and Literature. It also offers the Intensive Language Program, the English Support Center, and core education courses to all RHU students. The details of each program will follow.

ENGLISH LANGUAGE PROGRAM

Learning Objectives

The main goal of the Bachelor of Arts in English Language Program is to prepare interested students in English major to become 21st century competent English Language graduates by providing them with the essential linguistic, literature, fiction/non-fiction writing, and intercultural backgrounds to pursue a career and/or graduate work in their field. Following the most up-to-date teaching methods, the BA English Language Program helps students construct their own knowledge in the field, develop their critical thinking, and learn to work collaboratively with others. It also equips students with good research as well as literacy and critical thinking skills to meet the needs of the 21st century English language graduates.

Learning Outcomes

After completing all the required courses in the English Language program, students should be able to:

1. Identify different subfields in linguistics;
2. Use linguistic and literary terminology in the analysis of literary texts;
3. Differentiate among different theories in linguistics;
4. Analyze and critique different literary texts;
5. Communicate competently in English with speakers from diverse cultures;
6. Synthesize information obtained from different texts;
7. Conduct research related to English language;
8. Take up a profession in English language.

Career Opportunities

English Language graduates find fulfilling careers in a variety of professions in the public or the private sector such as: schools, translation firms, publishing houses, tourism industry public relation firms, voluntary and charitable organizations, and media organizations, to name a few. English Language graduates may become English teachers, editors, journalists, public relations practitioners, writers, translators, and many other professionals where skill in using language is essential. Many also pursue graduate studies in diverse fields, such as linguistics, education, literature, communication and more.

Program Overview

The Bachelor of Arts in English Language Program aims to provide students with the theoretical and practical understanding of the many functions of the structure, use, and

learning of English. This program also equips students with linguistic foundations, as well as a general background in literature and fiction/non-fiction writing. Through effective teaching, students develop their own critical and analytical thinking. Finally, this program prepares students to either pursue graduate studies or take up a profession in language-related fields.

To obtain a Bachelor of Arts degree in English Language, the student must complete a total of 93 credit hours. These hours cover University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours is shown in the following table:

BA in English Language (93 credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	9	-	6	15	30	32
College Requirement	-	-	9		9	10
Program Requirement	27	18	3	6	54	58
Credits	54		39		93	100

I. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Arts and Sciences section in this catalog.

II. College Requirements

The list of the College required courses and their descriptions are presented in the introductory pages of the College of Arts and Sciences section in this catalog.

III. Program Requirements

A. Mandatory Requirements

The English Language Program's mandatory courses are listed in the table below.

Course #	Title	Credits	Prerequisites
ENGL 222	Introduction to Language	3	
ENGL 250	Introduction to English Literature I	3	
ENGL 251	Introduction to English Literature II	3	ENGL 250
ENGL 342	Introduction to Shakespeare	3	ENGL 210
ENGL 350	History of the English Language	3	ENGL 222
ENGL 360	Introduction to Phonetics	3	ENGL 222
ENGL 370	Modern English Grammar	3	ENGL 210

ENGL 400	Advanced English Grammar	3	ENGL 370
ENGL 450	Advanced Academic Writing	3	ENGL 210
ENGL 462	Introduction to Psycholinguistics	3	
ENGL 463	Introduction to Sociolinguistics	3	
ENGL 465	Senior Project	3	ENGL 217; senior standing

B. Major Electives

As part of the program for the Bachelor of Arts in English Language, the student is required to study 18 credit hours of major electives. Major electives could be upper-level courses in English language, literature, or fiction/non-fiction writing. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. Meanwhile, they introduce an element of flexibility into the program, which allows students to individualize the program according to their own interests.

The student should select, in cooperation with the academic advisor, the elective courses that best meet his or her needs and aspirations. It is highly recommended that the student registers for these courses after completing the Departmental requirements. The table below lists some recommendations for major elective courses:

Course #	Title	Credits	Co-requisites
ENGL 221	English Composition and Rhetoric II	3	ENGL 210
ENGL 223	Introduction to Drama	3	ENGL 210
ENGL 235	Creative Writing	3	ENGL 210
ENGL 252	Introduction to American Literature	3	ENGL 210
ENGL 300	Introduction to World Literature	3	ENGL 210
ENGL 320	Creative Nonfiction	3	ENGL 210
ENGL 330	Language Acquisition	3	
ENGL 365	Applied Linguistics	3	
ENGL 420	Literature and Culture	3	
ENGL 460	Discourse Analysis	3	
ENGL 497I	Advanced Topics in English	3	Consent of instructor

Study Plan

The Bachelor of Arts in English Language encompasses 93 credit hours that are spread over 6 semesters and two summer sessions. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Fall Semester (15 Credits)			
ARAB 212	Arabic Language and Communication	2	
CMNS 200	Etiquette	1	Co-req.: ENGL 210
EDUC 222	Computer Applications in Education	3	

ENGL 210	English Composition and Rhetoric	3	ITP TOEFL 550/ or SAT 380+ or IELTS 6.5 or ENGL 101
ENGL 222	Introduction to Language	3	
ENGL 250	Introduction to English Literature I	3	
Year 1, Spring Semester (18 Credits)			
ENGL 217	Professional English Communication	3	ENGL 210
ENGL 251	Introduction to English Literature II	3	ENGL 250
ENGL 360	Introduction to Phonetics	3	ENGL 222
MATH 220	Statistics for Social and Behavioral Sciences	3	
	Community and Sustainability	3	
	Natural Science Elective	3	
Year 2, Fall Semester (15 Credits)			
ENGL 342	Introduction to Shakespeare	3	ENGL 210
ENGL 350	History of the English Language	3	ENGL 222 or consent of the instructor
	English Linguistics Elective	3	
	Technology Elective	3	
	Social Sciences	3	Co-req.: ENGL 210
Year 2, Spring Semester (15 Credits)			
ENGL 370	Modern English Grammar	3	ENGL 210
PSYC 301	Introduction to Psychology	3	Co-req.: ENGL 210
	Fiction | Nonfiction Writing Elective	3	ENGL 210
	Humanities/Culture Elective I	3	ENGL 210
	Social Sciences	3	Co-req.: ENGL 210
Year 3, Fall Semester (15 Credits)			
ENGL 400	Advanced English Grammar	3	ENGL 370
ENGL 450	Advanced Academic Writing	3	ENGL 210
ENGL 462	Introduction to Psycholinguistics	3	
	English Linguistic Elective	3	
	Humanities/Culture Elective II	3	ENGL 210
Year 3, Spring Semester (15 Credits)			
ENGL 463	Introduction to Sociolinguistics	3	
ENGL 465	Senior Project	3	ENGL 217; Senior Standing
	English Linguistic Elective	3	
	English Literature Elective	3	
	Fiction | Nonfiction Writing Elective	3	ENGL 210

Courses Description

Mandatory Courses

Major Courses

Descriptions of the major mandatory courses are given below.

ENGL 210	**English Composition and Rhetoric**	**3(3,0)**
This course reviews the fundamentals of good academic writing in English, teaches essay writing essentials and research skills in two rhetorical modes (persuasion and argumentation), and provides practice in writing essays in these modes, research paper, and oral presentation. **Prerequisite:** ENGL 101 or TOEFL 550+ (paper) or 80+ (computer).		

ENGL 217	**Professional English Communication**	**3(3,0)**
This is a required course designed to help students develop effective professional communication skills, both orally and in writing. In this course, students learn how to write emails, memos, letters, proposals, reports, and other forms of employment correspondence. In addition, this course helps students sharpen their presentation skills. Broadly, this course enables students to behave professionally and effectively in their prospective jobs. **Prerequisite**: ENGL 210.		

ENGL 222	**Introduction to Language**	**3(3,0)**
This course examines current areas in theoretical and applied linguistics including the different levels of structure, the nature of language acquisition, language variation and evolution, and language teaching.		

ENGL 342	**Introduction to Shakespeare**	**3(3,0)**
A course in which students study representative comedies, histories, and tragedies by Shakespeare. The plays are read intensively and understood in the context of the theatrical conventions of the period and the culture of play going in early modern England, as well as the social, cultural, religious, and intellectual history of the period. **Prerequisite**: ENGL 210		

ENGL 250	**Introduction to English Literature I**	**3(3,0)**
This course covers English literature from Anglo-Saxon times to the later eighteenth century. Specific texts by the principal writers of these periods will be examined against the social, historical, and philosophical background of the period.		

ENGL 251	**Introduction to English Literature II**	**3(3,0)**
This course continues the survey of English literature begun in Introduction to Literature I, moving from Blake to Eliot, through the examination of specific texts by major authors against the social, historical, and philosophical background of the period. **Prerequisite** ENGL 250		

ENGL 350	History of the English Language	3(3,0)
This is an introductory survey of the history of the English language from its earliest Indo-European origins to the present day. The nature and changes of the language are presented by reviewing the shifts that have occurred from Indo-European, Germanic, Old English, Middle English, up to Early Modern English. **Prerequisite**: ENGL 222 or consent of the instructor.		

ENGL 360	Introduction to Phonetics	3(3,0)
This is a course in which the students study the articulatory, auditory, and acoustic description of the sounds of the English language. This course also includes descriptions of the sounds of other languages. The practical component of this course involves practice in transcription and production of sounds in English language. **Prerequisite:** ENGL 222		

ENGL 370	Modern English Grammar	3(3,0)
This course teaches grammar through exploration and analysis. It provides a more detailed study of word and phrase formation, pragmatics, and critical analysis of descriptive uses of grammar are covered. **Prerequisite**: ENGL 210		

ENGL 400	Advanced English Grammar	3(3,0)
An advanced course in English grammar that provides students with the ability to analyze differences of the major English grammars. Traditional, descriptive, and transformational grammars are examined. **Prerequisite**: ENGL 370		

ENGL 450	Advanced Academic Writing	3(3,0)
This course allows students to further their academic writing skills through advanced independent research, writing and discussion related to a wide variety of academic topics. Students will receive rigorous training in research, critiquing and analyzing texts and resources, synthesis, and composition. This required course helps students to pursue graduate studies. **Prerequisite**: ENGL 210		

ENGL 465	Senior Project	3(3,0)
In this course, the students must pursue in groups a research study related to English language learning or teaching. **Prerequisite**: Senior standing.		

Non-Major Courses

ARAB 212	Arabic Language and Communication	2(2,0)
This course helps students develop their ability to communicate effectively in standard Arabic. It provides students with the necessary communication skills in Arabic they might need in their future jobs. Specifically, students learn how to write and orally present different forms of workplace documents in Arabic.		

CMNS 200	Etiquette	1(1,0)
This course is designed to help students develop interpersonal and communication skills fundamental for success in the workplace no matter what industry, organization,		

or sector they are employed in. Students will improve their professional style as they study topics including polite conversation, personal appearance, office politics, diplomacy, telephone, cell phone, and voicemail etiquette, the protocol of meetings, job interview presentation and even international travel. Students will participate in an off-campus formal dining experience. **Co-requisite:** ENGL 210.

EDUC 222	**Computer Applications in Education**	**3(3,0)**
This course focuses on general knowledge about the use of microcomputers in education, including the use of common computer applications such as word processing, spreadsheet, database, and presentation software in teaching/learning activities; as well as evaluating the effectiveness of educational software in teaching/learning in various subject matter areas.		

MATH 220	**Statistics for Social & Behavioral Sciences**	**3(3,0)**
This course introduces statistical techniques used in the analysis of social science research data. Topics include frequency distribution, central tendency, variability, probability theory, Bayes' rule, mathematical expectation, variance and covariance, binomial, Poisson, hypergeometric and normal distributions, sampling distributions, estimation problems and hypothesis testing. **Prerequisite**: None.		

PSYC 301	**Introduction to Psychology**	**3(3,0)**
This course is an introduction to the theories, concepts, and viewpoints that comprise the discipline of psychology. The course is directed toward the understanding of human behavior by dealing with such topics as history of psychology, learning, personality, behavior, motivation, perception, and social psychology, mental health as well as other areas. **Co-requisite**: ENGL 210.		

Major Elective Courses

Descriptions of some major elective courses are given below.

ENGL 223	**Introduction to Drama**	**3(3,0)**
In this course, you will explore what drama is, its basic elements, and its dramatic structure evolution over centuries. You will study selected and representative plays of different periods that help you broaden your understanding and appreciation of literature. The course also aims to develop your critical thinking and analysis and encourages you to respond critically to drama works in well-developed oral and written criticism.		

ENGL 235	**Creative Writing**	**3(3,0)**
This course introduces students to the process and practice of imaginative writing. Students will read works of fiction, creative nonfiction, and poetry, and will learn techniques for writing in those genres.		

ENGL 252	**Introduction to American Literature**	**3(3,0)**
This is a course which explores the works of major literary figures and authors representing different literary schools from the sixteenth century to modern times.		

Students will closely examine selected texts as literary achievements and set them within the historical context and framework of American culture. **Co-requisite**: ENGL 210.

ENGL 300	**Introduction to World Literature**	**3(3,0)**
The course surveys selected works in English or in translation from non-Anglo American cultural traditions. Texts can be drawn from African, Asian, European, Latin American and Middle Eastern literatures with a focus on their historical and cultural contexts. **Prerequisite**: ENGL 210.		

ENGL 330	**Language Acquisition**	**3(3,0)**
This course will survey language acquisition theories. It will deal with human language processing, learners' motivational factors and contextual factors that influence language learning. It will uncover the principles of first and second language acquisition.		

ENGL 365	**Applied Linguistics**	**3(3,0)**
This course is intended to give a broad overview of Applied Linguistics. It introduces learners to important areas in the field that increase their understanding of how language works in a wide range of personal, social, and professional environments. The course touches on practical issues such as the relationship between languages, cultures and societies, the acquisition of second and foreign language, and the teaching and learning of languages.		

ENGL 420	**Literature and Culture**	**3(3,0)**
A course that considers major works of literature, specifically in the context of twentieth-century cultural theory, including Marxism, post colonialism, national literatures, ethnic writings, and feminist theory. The primary intention of this course is to explore how various texts interact with their societies, or how those societies are influential in the construction of literary works.		

ENGL 430	**Advanced Language Acquisition**	**3(3,0)**
An in-depth exploration of current issues in language acquisition in relation to recent developments in linguistic theories. Diverse topics in language acquisition such as children's acquisition of pragmatics, school-aged acquisition, bilingualism, and foreign language acquisition will be discussed. **Prerequisite**: ENGL 365.		

ENGL 460	**Discourse Analysis**	**3(3,0)**
This course considers several approaches to analyzing written, spoken and sign language use as it is used in social science disciplines, including linguistics, sociology, anthropology, social work, psychology, and other disciplines. Students will learn methods of discourse analysis, including how to work with a variety of data. They will also consider various schools of thought that have evolved in discourse analysis.		

ENGL 462	Introduction to Psycholinguistics	3(3,0)
This course addresses the psychological and neurobiological aspects of language acquisition and how they influence humans' ability to learn, use and understand language. It also considers the relationship between language and thought.		

ENGL 463	Introduction to Sociolinguistics	3(3,0)
This course addresses the ways language serves and is shaped by society. It considers such topics as the variety of dialects across regions, gender differences in language usage, and the social functions of language.		

ENGL 497	Advanced Topics in English	3(3,0)
This course provides students with an in-depth study of selected topics related to linguistics, literature, or fiction/non-fiction writing. Students will be involved in research and teamwork activities. Prerequisite: Consent of the instructor		

Freshman English

ENGL 101	Freshman English	3(3,0)
This course helps students reinforce their reading and writing skills. It focuses on the interrelatedness between reading and writing whereby students critically read and write essays of different rhetorical modes (classification, cause/ effect analysis, and comparison/contrast analysis and persuasion). Some structural elements are reviewed to ensure accuracy in students' writing. Students are also introduced to research skills and APA documentation. **Prerequisite**: TOEFL Score of 514-549 or IELP 095.100		

Intensive English Language Program (IELP)

The mission of the Intensive English Language Program (IELP) at Rafik Hariri University is to provide incoming students with quality English language instruction to help them read, write, speak and understand English at increasing levels of proficiency. We prepare students to communicate effectively in English in a friendly and supportive learning environment.

English Placement Chart

Students are placed in levels according to their English proficiency and progress through the levels as their English skills grow. The contents of any level address a variety of language skills. The following table summarizes the number of credits per level, the number of courses a student is allowed to take, and the corresponding scores on standard tests (TOEFL, SAT and IELTS) required to be placed in IELP level.

IELP Level	# of Credits	Allowable Major Credits	TOEFL IBT	TOEFL ITP*	Old SAT (Writing)	New SAT (Writing)	IELTS
IELP 085	12	10	30 - 40	380-439**	320-339	18	3 – 3.5
IELP 095	12	10	41-52	440-479	340-359	19	4
IELP 100	6	13	53-64	480-513	360-379	20	4.5 –5

ENGL 101	3	Regular Student	65-79	514-549	380-399	21	5.5 -6
ENGL 210	3		80+	550+	400+	22+	6.5+

* These scores are compatible with the comparison table done by English Testing Service (ETS) and Common European Framework (CEFR).

Passing Criteria

The passing grade in any of the IELP levels is 60.

Promotion Criteria

Current IELP Level	Required Score to Skip Next Level	Level Skipped to
085	75 or above	IELP 100
095	75 and above	ENGL 101
IELP 100	70 and above	ENGL 210

During the advising period, faculty advisors should advise students who are enrolled in IELP 100 to register for ENGL 101. The registrar's Office shall drop the ENGL 101 and add ENGL 210 for the students who score 70 and above in IELP 100

IELP Courses Description.

The following are the descriptions of the IELP courses.

IELP 085	**Elementary English**	**12(12,0)**
This is a non-credit, elementary level English course which focuses on reading, writing, speaking, and listening. The course consists of twelve hours of classroom instruction over a 15-week semester. In this course, students develop elementary language skills in listening, speaking, reading, and writing. Students' work is mostly focused on integrating the reading-writing and speaking-listening skills into direct class activities. Students prepare for the TOEFL as a part of the curriculum. **Prerequisite:** TOEFL score 380-439 or its equivalent.		

IELP 095	**Intermediate English**	**12(12,0)**
This is a non-credit, intermediate level English course which focuses on reading, writing, speaking, and listening. The course consists of twelve hours of classroom instruction over a 15-week semester. In this course, students develop intermediate language skills in listening, speaking, reading, and writing. Students' work is mostly focused on integrating the reading-writing and speaking-listening skills into direct class activities. Students prepare for the TOEFL as a part of the curriculum. **Prerequisites:** TOEFL score 440 – 479 or its equivalent or IELP 085.		

IELP 100	**Advanced English**	**6(6,0)**
This course helps students develop their reading and writing skills. It teaches students to read critically and write paragraphs/essays in different rhetorical modes. It gives		

special attention to sentence structure and editing skills. It introduces students to research skills as evaluating sources, summarizing, paraphrasing, and quoting are introduced. **Prerequisite**: TOEFL score of 480 – 513 or IELP 095.

English Support Center

RHU English Language Support Center, located in I107 with its allocated computer lab, provides support to all RHU community in English usage and proficiency development. Any student, faculty or staff member seeking assistance with English language and composition is encouraged to make an appointment with or drop by the English Support Center. Faculty members may also refer students with English language problems for individualized tutorials. It is staffed by RHU English faculty members.

Services include consultations on essay and research paper writing, presentations, CV, and cover letter writing. In addition, skill practice, study skills, self-study materials for checkout, English as a Second Language lab practice, GMAT and GRE preparation and more are available. These services are provided free of charge to all RHU students, graduate and undergraduate, as well as faculty and staff. Students are encouraged to use these services to improve their English language skills.

Minor in English Language and Literature

Program Objectives

The aim of this minor is to help interested students of diverse majors to advance their knowledge of English language and literature. The primary objectives of this minor program are:

a. Familiarize students with linguistic and literary concepts,
b. Equip students with skills to interpret and analyze English texts and utterances,
c. Improve students' English language competencies.

Learning Outcomes

Upon completion of this minor, students will be able to:

a. Use linguistic and literary concepts and terminology correctly,
b. Analyze different linguistic and literary texts,
c. Produce essays/papers in the discipline that follow professional rules and conventions.

Admission Requirements

1. To be eligible to apply for a minor in English Language and Literature, students should achieve a minimum of 70 in ENGL 210
2. To graduate with a minor in English Language and Literature, students must fulfill the following requirements:
    a. Completing a minimum of 18 credits offered in the English Language Program, two of which are mandatory, namely ENGL 222: Introduction to Language and ENGL 250: Introduction to Literature. The other four courses, which are minor electives, should be chosen from the list of elective courses listed below.
    b. Achieving a minimum CGPA of 70 in all the 18 credits.

Career Options

A minor in English Language and Literature is a great way to complement a variety of majors. A minor of English Language and literature can be paired with business majors such as HR, management, and marketing. It could also be paired up with math, computer science, and education majors among others. Graduates with a minor in English Language and Literature can take teaching, administrative, and/ or editing positions. It can open several opportunities for these graduates, among which is pursuing a degree in computational linguistics (when coupled with computer science) and a TD as well as MA in TESOL/TEFL.

Curriculum

Besides the required courses, students are free to choose any 12 credit hours, but are encouraged to consult with the program advisor about the appropriate choices, given their educational and career goals.

Elective Courses (12cr.):

a. ENGL 251 Introduction to English Literature II
b. ENGL 342 Introduction to Shakespeare
c. ENGL 350 History of the English Language
d. ENGL 360 Introduction to Phonetics
e. ENGL 370 Modern English Grammar
f. ENGL 400 Advanced English Grammar
g. ENGL 450 Advanced Academic Writing
h. ENGL 462 Introduction to Psycholinguistics
i. ENGL 463 Introduction to Sociolinguistics
j. ENGL 223 Introduction to Drama
k. ENGL 235 Creative Writing
l. ENGL 252 Introduction to American Literature
m. ENGL 300 Introduction to World Literature
n. ENGL 320 Creative Nonfiction
o. ENGL 330 Language Acquisition
p. ENGL 365 Applied Linguistics

Minor in Psychology

Program Objectives

The aim of this minor is to help interested students of diverse majors to advance their knowledge in the field of Psychology. The main objectives of the minor program are:

a. Familiarize students with theories of psychology
b. Equip students with the skills in psychological research.
c. Improve student's competencies in understanding human behavior.

Learning Outcomes

Upon completion of this minor, students will be able to:

a. Differentiate between psychology theories
b. Analyze human behavior by referring to varied theories
c. Interpret human behavior as related to different situations.

Admission Requirements

1. To be eligible to apply for a minor in Psychology, students should achieve a 70 in PSYC 301: Introduction to Psychology.
2. To graduate with a minor in Psychology, students must fulfill the following requirements:
   a. Completing a minimum of 18 credits offered in the Languages and Liberal Arts Department, one of which is mandatory, PSYC 301: Introduction to Psychology
   b. Achieving a minimum GPA of 70 in all 18 credits.

Career options

A minor in Psychology is a good option to complement a variety of majors. The Psychology major can be paired with any major at any colleges. Students in this field learn the fundamentals of how humans behave, think, and react, which are key skills in a number of professions, especially those that work directly with clients. College graduates who have a psychology minor have plenty of career options, ranging from nursing and social work to teaching, police work and business.

Curriculum

Besides the required course, students are free to choose any 15 credit hours, but are encouraged to consult with their advisor about the appropriate choices.
Elective Courses (15 cr.)

PSYC 302	Social Psychology
PSYC 303	Psychology of Personality
PSYC 305	Introduction to Special Needs

PSYC 306	Psychology of Women
PSYC 310	Positive Psychology
PSYC 312	Children and War
PSYC 314	Psychology for sustainability
SOCI210	Research Methods in Social Science
PSYC 400	Conflict Transformation
PSYC410	Abnormal Psychology
PSYC 315	Emotional Intelligence
	*Any other approved PSYC elective course

COMPUTER AND INFORMATION SYSTEMS DEPARTMENT (CIS)

Faculty Members

Chairperson:	Mohamad El-Abed
Professors:	Mahmoud Halablab
Associate Professor:	Houssam Salami, Ghalia Nassreddine
Assistant Professor:	Ali Rammal, Lara Abou Orm, Roaa Soloh
Instructors:	Roba Al Hajj
Adjunct Faculty:	Elissar Nasreddine; Hana Hajj Chehade, Hussein Wehbe, Mohamad Wehbe, Talal Salemeh,

Programs Offered

The CIS Department offers three programs – Computer Science, Healthcare Information Systems, and Mathematics. Each program grants a Bachelor of Science degree. The details of each program will follow.

Vision

The vision of the Computer and Information Systems (CIS) Department is to achieve academic excellence beyond accreditation standards in computing technologies and Information Systems.

COMPUTER SCIENCE PROGRAM

Mission

The mission of the Computer Science program is devoted to provide students with a state-of-the-art curriculum, maintain persistent relationships with industry in order to create opportunities for students, cultivate learners with a sense of responsibility towards the profession and a passion for long life learning, and provide the educational experiences that will enable our students to be innovative generations.

Objectives

The program educational objectives of the Computer Science program intend to enable its graduates within a few years of graduation to:

- Solve computing problems of varying complexity that meet local, regional or global markets
- Demonstrate professional skills and ethical behavior in practicing their profession
- Progress in computing and other professionally related fields at the level of professional employments or graduate studies

Program Outcomes

Upon successful completion of the BS program in Computer Science, an RHU graduate in Computer Science should demonstrate the following:

1. Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.

2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

3. Communicate effectively in a variety of professional contexts.

4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

Accreditation

The Bachelor of Science program in Computer Science has been accredited by the Computing Accreditation Commission (CAC) of ABET, 415 North Charles Street, Baltimore, MD 21201; www.abet.org.

ABET accreditation verifies that our educational experience meets the global standard for technical education in the computer science profession and enhances employment opportunities for our graduates.

Career Opportunities

Computer Science major opens various opportunities and prepare students for careers in a variety of sectors in industries, governmental and academic units, TV stations, banking sector, and far more. You will find our graduates in jobs like games developer, system analyst, software engineer, web designer, mobile application developer, database analyst/developer/administrator, network engineer/administrator, data analyst, AI developer, and IT consultant. It is challenging work, but it is very rewarding. Rewarding intellectually, because you get to work on interesting problems, and rewarding financially as well.

Program Overview

The Computer Science Program at Rafik Hariri University develops students' computational and critical thinking skills and shows them how to create, not simply use, new technologies. Students learn how to think and solve problems in a logical way by acquiring the fundamentals principles of sciences as well as advanced techniques that are currently used for practical systems development. They also learn oral communication and presentational proficiencies that enable them to work with multicultural teams. Furthermore, they learn how to work on individual and team projects to develop new systems, which enhance time management and team coordination skills. Graduates of RHU's Computer Science Department are lifetime learners; they are able to adapt quickly to this ever-changing challenging field.

To obtain a Bachelor of Science degree in CS, the student must complete a total of 94 credit hours. These hours span University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours is shown in the following table:

BS in Computer Science (94 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	6	–	15	9	30	32

College Requirement	–	–	–	–	-	0
Program Requirement	36	9	19	–	64	68
Credits	42	9	34	9	94	100

I. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Arts and Sciences section in this catalog.

II. College Requirements

The list of the college required courses and their descriptions are presented in the introductory pages of the College of Arts and Sciences section in this catalog.

III. Program Requirements

A. Mandatory Requirements

Mathematics requirements
The mathematics requirement courses are listed in the table below.

Course #	Title	Credits	Prerequisites
MATH 210	Discrete Mathematics	3	
MATH 211	Calculus III	4	
MATH 311	Linear Algebra	3	
MATH 421	Numerical Analysis	3	MATH 311

Business requirements
The business requirement courses are listed in the table below.

Course #	Title	Credits	Prerequisites
BMKA 200	Introduction to Marketing	3	Co-req.: ENGL 210
BMGT 300	Project Management	3	Junior Standing

Major requirements
The CS mandatory core courses are listed in the table below.

Course #	Title	Credits	Prerequisites
COSC 215	Advanced Programming and Data Structures	3	COSC 214
COSC 231	Database Management Systems	3	COSC 214
COSC 316	Design and Analysis of Algorithms	3	COSC 215
COSC 333	Web Programming	3	COSC 214
COSC 341	Software Engineering	3	COSC 214

COSC 351	Logic Design	3	
COSC 351L	Logic Design Lab	1	Co-req: COSC 351
COSC 353	Computer Organization	3	COSC 351
COSC 360	Networking	3	COSC 214
COSC 360L	Networking Lab	1	Co-req: COSC 360
COSC 399	Co-op Training Experience	1	ENGL 217; Senior Standing
COSC 421	Theory of Computation	3	COSC 215 and MATH 210
COSC 451	Operating Systems	3	COSC 214
COSC 490	Summative Learning Experience	3	ENGL 217

B. Technical Electives

As part of the program for the Bachelor of Science in Computer Science, the student is required to study 9 credit hours of technical elective courses. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. The student can also mix and match elective courses from the different areas to get a more general exposure to the different Computer Science disciplines. The student should select, in cooperation with the academic advisor, the list of electives that best meet his or her needs and aspirations. The listed technical elective courses and other courses from engineering programs, in addition to the required program courses, are designed to allow the student to develop in-depth knowledge and understanding in the following areas:

1. Internet and Computer Networks
2. Game Design and Development
3. Artificial Intelligence and Data Mining
4. Mobile/Web Design and Development

The CS elective courses are listed in the table below:

Course #	Title	Credits	Prerequisites
CCEE 426	Design of Embedded Systems	3	COSC 351
CCEE 561	Computer Vision	3	COSC 214
CCEE 566	Natural Language Processing	3	COSC 214
COSC 434	Advanced Web Programming	3	COSC 231 and COSC 333
COSC 435	Mobile Application Development	3	COSC 214
COSC 436	Game Programming	3	COSC 214
COSC 438	Introduction to Software Testing	3	COSC 341
COSC 461	Advanced Networking	3	COSC 360
COSC 463	Cybersecurity Operations	3	COSC 360
COSC 480	Machine Learning and Data Mining	3	COSC 214; MATH 351 or BADM 250
COSC 481	Artificial Intelligence	3	COSC 214

COSC 482	Data Science and Web Scraping	3	Co-req.: COSC 333 and MATH 351
COSC 496	Independent Study I	3	Senior Standing and a CGPA of 80 and above.
COSC 497	Independent Study II	3	Senior Standing and a CGPA of 80 and above.
COSC 498	Special Topics in Computer Science	3	Senior standing
HCIS 341	Health Information Systems I	3	
HCIS 342	Health Information Systems II	3	HCIS 341

Or any other approved CS elective course.

In addition, the students can take the following three labs instead of one elective.

Course #	Title	Credits	Prerequisites
Networking			
COSC 460L	Networking Lab 2	1	Co-req.: COSC 360L
COSC 461L	Networking Lab 3	1	COSC 460L
COSC 462L	Networking Lab 4	1	Co-req.: COSC 461L

Or any other approved CS elective course.

C. Summative Learning Project

Students must complete a 3- credit hours course (COSC 490 Summative Learning Experience) in which they work preferably in groups on a problem of concern to industry or the community at large, or to innovate a promising idea. The SLP could be an extension of the projects that the students had worked on computing courses to bring it to a more useful outcome.

D. Co-op Training Experience

Each student must complete 8 weeks of practical training in an area related to his/her field of interest. The Co-op experience is usually fulfilled during the summer semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on student's progress throughout the Co-op period by conducting field visits and ensure that student's performance is aligned with his/her aspirations and employer's needs. Students are required to submit a formal report, a poster and make a formal presentation about their Co-op experience. While ENGL 217 and senior standing are the essential prerequisites to pursue the co-op training, the program has the mandate to require stipulate additional conditions.

Course Coding

The courses offered in the CS program are designated code numbers in the form of (COSC abc) where:

a Designates year/level

b Designates area as follows:
1. Computer Software; 2. Computer Science Theory; 3. Mobile/Web Development; 4: Systems Analysis and Design; 5: Computer Hardware; 6: Networking and Security

c Designates course sequence in an area

Study Plan

The Bachelor of Science in Computer Science encompasses 94 credit hours that are spread over 6 semesters and two summer sessions. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Semester 1 (16 Credits)			
COSC 214	Introduction to Programming	3	
COSC 351	Logic Design	3	
ENGL 210	English Composition and Rhetoric	3	Placement
MATH 211	Calculus III	4	
	Natural Sciences and Technology Elective	3	
Year 1, Semester 2 (16 Credits)			
ARAB 212	Arabic Language and Communication	2	
COSC 215	Advanced Programming and Data Structures	3	COSC 214
COSC 231	Database Management Systems	3	COSC 214
COSC 351L	Logic Design Lab	1	COSC 351
CMNS 200	Etiquette	1	Co-req.: ENGL 210
ENGL 217	Professional English Communication	3	ENGL 210
MATH 210	Discrete Mathematics	3	
Summer Session (3 Credits)			
	Humanities/Fine Arts Elective	3	
Year 2, Semester 1 (16 Credits)			
COSC 316	Design and Analysis of Algorithms	3	COSC 215
COSC 333	Web Programming	3	COSC 214
COSC 360	Networking	3	COSC 214
COSC 360L	Networking Lab	1	Co-req,: COSC 360
MATH 351	Probability and Statistics	3	MATH 211
	Social Science/Culture Elective I	3	
Year 2, Semester 2 (15 Credits)			
BMKA 200	Introduction to Marketing	3	ENGL 210
COSC 341	Software Engineering	3	COSC 214
MATH 311	Linear Algebra	3	
	CS Major Elective I	3	

	CS Major Elective II	3	
Summer Session (1 Credit)			
COSC 399	Co-op Training Experience	1	ENGL 217; Senior Standing
Year 3, Semester 1 (15 Credits)			
COSC 353	Computer Organization	3	COSC 351
COSC 421	Theory of Computation	3	COSC 215 and MATH 210
COSC 451	Operating Systems	3	COSC 214
GRDS 440	Design and Social Impact	3	Junior Standing
	Social Sciences/Culture Elective II	3	
Year 3, Semester 2 (12 Credits)			
BMGT 300	Project Management	3	Junior Standing
COSC 490	Summative Learning Experience	3	ENGL 217
MATH 421	Numerical Analysis	3	MATH 311
	CS Major Elective III	3	

Courses Description

I. Mandatory Courses

Descriptions of the major mandatory courses are given below.

COSC 214	**Introduction to Programming**	**3(2,2)**
This course presents the fundamentals of structured and modular programming concepts. It covers primitive data types, expressions, control statements, functions, arrays, basic searching/sorting algorithms, and introduction to pointers. **Prerequisite**: None. Equivalent to CCEE 214.		

COSC 215	**Advanced Programming and Data Structures**	**3(2,2)**
A continuation of COSC 214, this course covers the basics of Object-Oriented Programming (OOP) languages and data structures. It covers pointers, classes, encapsulation, constructors/destructors, object instantiation, and templates. The course also covers a detailed study of data structures and applications such as stacks, queues, lists, and trees. **Prerequisite***:* COSC 214. Equivalent to CCEE 216.		

COSC 231	**Database Management Systems**	**3(3,0)**
This course exposes students to the fundamental concepts necessary for designing, using, and implementing database systems. It covers database concepts, data modeling, relations, normalizations, and data manipulation languages. **Prerequisite***:* COSC 214. Equivalent to CCEE 315.		

COSC 316	Design and Analysis of Algorithms	3(3,0)
This course consolidates algorithm design and programming techniques. It provides an extended study of Object-Oriented Programming properties, data structures and data abstraction, and an introduction to complexity consideration. **Prerequisite***:* COSC 215.		

COSC 333	Web Programming	3(3,0)
This course teaches students how to develop and implement web-based programs with emphasis on front-end programming. It introduces students to web development and to different client-side languages and styles needed to develop adequate and responsive websites. The course covers HTML5, CSS3, JavaScript/jQuery and responsive design. Equivalent to CCEE 411. **Prerequisite***:* COSC 214.		

COSC 341	Software Engineering	3(3,0)
This course provides a deep and comprehensive understanding of the fundamentals of software engineering. The course initiates students to the different software process models, project management, software requirements, and engineering process. The course covers SDLC stages, UML diagrams, and the use of CASE tools. **Prerequisite***:* COSC 214. Equivalent to CCEE 310.		

COSC 351	Logic Design	3(3,0)
This course addresses Boolean algebra and logic simplification techniques, data representation, and the design of combinational logic networks for decoders, encoders, multiplexers, and demultiplexers. Design of sequential logic devices including flip-flops, registers, and counters, as well as analysis of devices used to build logic networks, including programmable logic devices**. Prerequisite***:* None*.* Equivalent to CCEE 221.		

COSC 351L	Logic Design Lab	1(0,2)
This Lab covers design techniques and implementation of combinational and sequential logic circuits. Experiments include logic gates, design and implementation of logic circuits, combinational logic circuits (decoders, encoders, multiplexers, demultiplexers and adders), and design of sequential logic devices using flip-flops, registers, and counters. **Prerequisite**: COSC 351. Equivalent to CCEE 221L.		

COSC 353	Computer Organization	3(3,0)
This course exposes students to computer system organization and design, implementation of CPU data path and control, instruction set design, memory hierarchy (caches, main memory, virtual memory) organization and management, input/output subsystems (bus structures, interrupts, DMA), performance evaluation, and pipelined processors. **Prerequisite**: COSC 351. Equivalent to CCEE 324.		

COSC 360	Networking	3(3,0)
This course enables students to gain fundamental knowledge of computer networks, appreciate various tradeoffs and choices in networking, learn to design and analyze protocols, and get ready for studying advanced topics in the field of networks. **Prerequisite***:* COSC 214. Equivalent to CCEE 354*.*		

COSC 360L	Networking Lab	1(0,2)
This Lab helps prepare students seeking to pass advanced Cisco Certifications. The student will acquire the knowledge of the functionalities of network equipment and protocols, learn how to build a simple Ethernet network using routers, switches and computers, and use router CLI commands to perform basic configuration and verification. The student will also learn valuable network problem solving techniques and concepts. Accompanying Lab for COSC 360. **Co-requisite**: COSC 360.		

COSC 399	Co-op Training Experience	1(1,0)
Each student must complete 8 weeks of practical training in an area related to his/her field of interest. This Co-op work experience is usually fulfilled during the summer semester of the third year into the program. Students are required to submit a formal report, and/or poster, and make a formal presentation about their Co-op experience. **Prerequisite***:* ENGL 217; Senior Standing.		

COSC 421	Theory of Computation	3(3,0)
This course covers theoretical principles embodied in automata and grammars. Topics include Deterministic, Non-deterministic, and Epsilon Non-deterministic Finite Automata (DFA, NFA, and e-NFA), DFAs minimization, equivalence of NFAs and DFAs, Moore and Mealy machines, closure properties, regular expressions, regular languages, regular grammar, pumping lemma, context free languages, context free grammar, pushdown automata, Turing machines, and other selected topics as time permits. **Prerequisite***:* COSC 215 and MATH 210		

COSC 451	Operating Systems	3(3,0)
Students learn the concepts of operating systems theory and their implementations. The course covers computer and operating system structures, process and thread management, process management and synchronization, deadlocks, security and protection, inter-process communication, memory management, and I/O control system. A case study of a UNIX operating system will accompany the course. **Prerequisite***:* COSC 214. Equivalent to CCEE 412.		

COSC 490	Summative Learning Experience	3(3,0)
This is a whole year graduation project directed on individual problems and research. Each student will have to complete it in her/his emphasis area. **Prerequisite***:* ENGL 217.		

Business Required Courses

The COSC program requires two business courses, BMKA 200 and BMGT 300 described below.

BMGT 300	Project Management	3(3,0)
This course provides the students the necessary skills to manage their business projects using effective techniques in leading, organizing, scheduling, and controlling the tasks contributing to the project goals. Topics include selection and statement of		

work of projects; skills of project managers and task break down structure, PERT/CPM scheduling and budgeting, **Prerequisite:** Junior Standing.

BMKA 200	**Introduction to Marketing**	**3(3,0)**
This course introduces the basic principles, theories, and practices of marketing in our modern ever-changing business environment. The course covers the marketing process activities on how to create value for customers to capture value from customers in return. It also discusses the marketing mix and how to build long-term customer relationships with customers. Students will analyze case studies about a "real-life" product or service. Videos and in-class discussions on current marketing topics will assist in the learning experience. **Co-requisite**: ENGL 210		

II. Elective Courses

Descriptions of the major elective courses are given below.

CCEE 426	**Design of Embedded Systems**	**3(3,0)**
This course addresses the design of embedded real-time systems, models of computation, validation techniques, and automatic synthesis. Finite state machines, synchronous languages, data flow networks, petri nets, software optimization and performance estimation, operating systems and scheduling, system-level simulation, and interface-based design. **Prerequisite**: CCEE 221. Equivalent to COSC 356.		

COSC 434	**Advanced Web Programming**	**3(3,0)**
This course is a continuation of the web-programming course and trains students to become full stack developers. It allows students to get to know how to develop back-end programs, connect their website or web application to a database, use regular expressions, develop asynchronous client access to server data, work with structured data formats such as JSON, as well as working with a third-party medium like web services. **Prerequisite:** COSC 231 and COSC 333. Equivalent to CCEE 514.		

COSC 435	**Mobile Application Development**	**3(2,2)**
This course examines the principles of mobile application design, development, and testing. It covers memory management, user interface design, input methods, data handling, and network techniques. Students are expected to work on a project that produces a professional-quality mobile application. Projects will be deployed in real-world applications. **Prerequisites***:* COSC 214, Equivalent to CCEE 511		

COSC 436	**Game Programming**	**3(2,2)**
This course presents an overview of the software technologies related to game development. It provides the students with a conceptual understanding of the field of game design along with practical exposure to the process of creating a game. **Prerequisite***:* COSC 214; Senior standing.		

COSC 438	Introduction to Software Testing	3(3,0)
This course will introduce the students to the field of software testing; its importance, goals, approaches, and major player's roles (developers, testers, and users). Students will learn about software testing life cycle, standards, types of testing (manual vs automated testing), testing methods (black box vs white box), testing levels (functional, unit testing…), and documentation. A hands-on experience of automated testing tools will be also covered in this course. **Prerequisite***:* COSC 341		

COSC 460L	Networking Lab 2	1(0,2)
This Lab helps prepare students seeking to pass Cisco - Routing and Switching Essentials (CCNA 2) Certifications. The primary focus of this Lab is routers and switches in small networks. The student will learn the architecture, components, and operations of routers and switches, in addition to their configuration with basic functionalities. They will also learn how to configure and troubleshoot static and dynamic routing protocols, access control lists, VLAN, DHCP for IPv4 and IPv6 networks, and NAT operations. **Co-requisite**: COSC 360L.		

COSC 461	Advanced Networking	3(3,0)
This course prepares students to act as a System and Network Administrator by implementing Active Directory Directory Service ADDS in distributed environments that can include complex network services and domain controllers. The covered materials assist students to efficiently automate the administration of users, groups, and computers. **Prerequisite***:* COSC 360.		

COSC 461L	Networking Lab 3	1(0,2)
This Lab helps prepare students seeking to pass Cisco - Routing and Switching Essentials (CCNA 3) Certifications. The primary focus of this Lab is routers and switches in large and complex networks. The student will learn how to configure routers and switches with advanced functionalities. They will also learn how to configure and troubleshoot enhanced switching technologies, first hop redundancy protocol in a switched network, wireless routers and clients, and routers in complex networks. Finally, they will learn how to manage CISCO IOS software licensing and configuration files. **Prerequisite**: COSC 460L.		

COSC 462L	Networking Lab 4	1(0,2)
This Lab helps prepare students seeking to pass Cisco – Connecting Networks (CCNA 4) Certifications. The primary focus of this Lab is Wide Area Network (WAN) technologies and the services provided by complex networks to support converged applications. The student will learn how to configure and troubleshoot routers for WAN, NATing for IPv4 network, serial, and broadband connections, tunneling operations, and monitoring Site-to-site connectivity with highlight on security. They will also learn how to configure and troubleshoot network management operations using syslog, SNMP, and Netflow. Finally, they will understand virtual private network (VPN) benefit and operations, borderless networks' architecture, data centers and virtualization architecture, and collaboration technologies and solution. **Co-requisite**: COSC 461L.		

COSC 463	Cybersecurity operations	3(3,0)
This course is a hands-on, career-oriented course that focuses on practical topics to prepare students to acquire the required skills to work in cybersecurity domain. The course will help students seeking to pass Cybersecurity Operation Associate CISCO Certification. **Pre-requisite**: COSC 360 (or CCEE 354).		

COSC 480	Machine Learning and Data Mining	3(3,0)
This course introduces students to the basic knowledge representation and learning techniques. The emphasis consists of understanding the data mining process, as well as being able to practically apply the corresponding approaches in solving practical problems and developing intelligent software applications. The course covers several topics that lie within classification, prediction, and clustering. **Prerequisites***:* COSC 214; MATH 351 or BADM 250. Equivalent to CCEE 564.		

COSC 481	Artificial Intelligence	3(3,0)
This course introduces students to the basic knowledge representation and learning methods of artificial intelligence. The emphasis will be on understanding the fundamental artificial intelligence concepts, as well as being able to practically apply the corresponding approaches in solving practical problems and developing useful software applications. Covered topics include Intelligent agents, informed and uninformed search strategies, and adversarial search. The python language libraries will also be introduced. **Prerequisite**: COSC 214. Equivalent to CCEE 562.		

COSC 482	Data Science and Web Scraping	3(3,0)
Data is becoming the fuel of the 21st century, and acquiring any skill related to data processing and analysis is becoming a must. In this course, we introduce data science processes with a focus on web scraping as an application. The course will combine different domains, i.e., web programming, system programming, and machine learning. In particular, the course focus on analyzing the HTML code of webpages using python, analyze the available information, and generate dashboards. Co-requisite: COSC 333 (or CCEE 411) and MATH 351 (or BADM 250).		

COSC 496	Independent Study I	3(3,0)
This course gives the student the opportunity to explore new academic research/study not available in regular courses. It might be an interdisciplinary research project in a field of special interest. **Prerequisites**: Senior Standing and a CGPA of 80 and above.		

COSC 497	Independent Study II	3(3,0)
This course gives the student the opportunity to explore new academic research/study not available in regular courses. It might be an interdisciplinary research project in a field of special interest. **Prerequisites**: Senior Standing and a CGPA of 80 and above.		

COSC 498	Special Topics in Computer Science	1-3 credits
A special topic course to be defined based on current trends and departmental special interests. It may incorporate technical seminars, advanced readings and special projects as required/approved by the department. **Prerequisite**: Senior standing.		

MINOR IN COMPUTER SCIENCE

Rationale

The CIS department offers a minor in Computer Science for RHU students. It is designed for students who want to include basic proficiency in computer science to enhance or supplement their major program.

Program Objectives

The aims of a minor in Computer Science are:

- Provide RHU graduates with a basic proficiency in computer science
- Support RHU graduates with essential computing skills desired/demanded by the market

Learning Outcomes

At the end of this minor, the student is expected to demonstrate:

- An ability to analyze a problem, identify and define the computing requirements appropriate to its solution
- An ability to use current techniques, skills, and tools necessary for computing practices
- An ability to develop programming skills using modern programming languages

Entrance Requirements

This minor is offered to all RHU students except CCE and Business IT Management students.

Early in their major, interested RHU students need to fill in the appropriate form declaring that they will be minoring in Computer Science while completing their regular major.

Computer Science Minor Policies

- Obtain a Minor Cumulative Grade Point Average of no less than 70%
- Although common courses between student major requirements and Computer Science minor requirements are counted to fulfill the minor requirements, the student must complete a minimum of 6 credit hours of coursework that are not counted toward the requirement for his/her major or any other minor.

Career Options

This minor allows its holders to seek careers in a variety of sectors no matter what a student's major is. Graduates from this minor can seek jobs related to software engineering, web and mobile development, database/system administration, network engineering/administration, and IT consultancy.

Curriculum and Program

The Computer Science minor consists of six courses (18 credits) in which two are mandatory and four are electives, selected to satisfy the requirements of the proposed program objectives and learning outcomes.

I. Mandatory Courses

The two mandatory courses (6 credits) are:

COSC 214	Introduction to Programming	3(2,2)
COSC 215	Advanced Programming and Data Structures	3(2,2)

II. Elective Courses

The elective courses will be chosen with the Computer Science minor advisor based on students' needs and background. Students may choose four elective courses (12 credits) from the following list.

COSC 231	Database Management Systems	3(3,0)
COSC 316	Design and Analysis of Algorithms	3(3,0)
COSC 333	Web Programming	3(3,0)
COSC 341	Software Engineering	3(3,0)
COSC 351	Logic Design	3(3,0)
COSC 434	Advanced Web Programming	3(3,0)
COSC 435	Mobile Application Development	3(2,2)
COSC 436	Game Programming	3(3,0)
COSC 438	Introduction to Software Testing	3(3,0)
COSC 451	Operating Systems	3(3,0)
COSC 480	Machine Learning and Data Mining	3(3,0)
COSC 481	Artificial Intelligence	3(3,0)
COSC 482	Data Science and Web Scraping	3(3,0)
Any other approved CS elective course		

MINOR IN DATA ANALYTICS

Rationale

"Information is the oil of the 21st century, and analytics is the combustion engine" - P. Sondergaard.

Are you a student in Business, Engineering, or Science? Do you want to add a new dimension to your areas of expertise to boost your career? You can do that and more by enrolling in the new minor in DATA ANALYTICS (DA). The demand for data analytics expertise grew rapidly over the past few years and is expected to grow even faster in the next years. Students graduating with a data analytics minor are set to position themselves to bridge the gap in their chosen field.

Program's Purpose

Graduates of this minor will be able to use their acquired skills across a wide range of industries as well as in the non-profit and government sectors. Telecommunication, banking, financial services, environmental sector, energy, biomedical, police, biology, bioinformatics, and physics are but a few of the areas in which you will be able to operate. The minor shall also serve as good preparation for further and more advanced graduate and/or professional studies in Data Analytics and related areas.

Learning Outcomes

At the end of this minor, the student is expected to demonstrate ability to:

- Use current techniques, architectures, and tools to collect and store data;
- Apply data analytics tools and techniques to support and improve decision making;
- Design systems and tools to interpret and visualize data.

Entrance Requirements

This minor is offered to all RHU students except CCE students.

Early in their major, interested RHU students need to fill in the appropriate form declaring that they will be minoring in Data Analytics while completing their regular major.

Program Requirements

This minor is structured to accommodate undergraduate RHU students in the BE or BS program from different disciplines (engineering, computer science, business). It may also

be offered to students with a BS/BE from other universities subject to a case-by-case evaluation of their transcripts and other specific RHU requirements.

Early in their studies, interested students need to declare their intention to seek a minor in DA, by filling out the pertinent minor declaration form and informing their advisor.

To successfully complete the DA minor, a student must

1) Declare a minor in Data Analytics by completing the Minor Declaration Form;
2) Obtain the approval of the dean of the student's college major and the dean of the College of Arts and Sciences;
3) Earn a Minor Cumulative Grade Point Average of no less than 70%;
4) Complete 18 credits of coursework as specified below.

It should be noted that common courses between student major requirements and data analytics minor requirements are counted to fulfill the minor requirements. The student must complete a minimum of 6 credit hours of coursework that are not counted toward the requirement for his/her major or any other minor.

Career Options

In today's world, most sectors and industries involve some form or another of data analysis. Therefore, minor holders would be well suited to work in a variety of sectors including, but not limited to, telecommunication, banking, financial services environmental, energy, biomedical, police, biology, and physics.

Moreover, minor holders may also assume such specialized roles as Data Scientist, Data Analyst, Data Engineer etc.

Curriculum and Program

The data analytics minor consists of six courses (18 credits) in which three are mandatory and three are elective, selected to satisfy the requirements of the proposed program objectives and learning outcomes.

I. Mandatory Courses

The three mandatory courses (9 credits) are:

BADM 250/Math 351	Business Statistics/Probability and statistics	3(3,0)
COSC 480/BITM 350	Machine Learning and Data Mining/Fundamentals of Data Analytic	3(3,0)
CCEE 567 / BADM 420	Optimization / Quantitative Methods for Business	3(3,0)

II. Elective Courses

Students may choose three elective courses (9 credits) from the following list or any other approved course.

COSC 316	Design and Analysis of Algorithms	3(3,0)
COSC 481	Artificial Intelligence	3(3,0)
COSC 482	Data Science and Web Scraping	3(3,0)
CCEE 516	Advanced Programming and Database Management Systems	3(2,2)
CCEE 568	Big data and analytics/Big data system	3(3,0)
CCEE 561	Computer Vision	3(3,0)
CCEE 566	Natural Language Processing	3(3,0)
CCEE 612	Advanced Data Mining	3(3,0)
BITM 415	Business Intelligence	3(3,0)
BMKA 420	Digital and Social Media Marketing	3(3,0)

It should be noted that CBA students (excluding BITM students) can also choose from the following list:

COSC 214	Introduction to Programming	3(3,0)
COSC 333	Web Programming	3(3,0)

III. Courses Description

BADM 250	**Business Statistics**	**3(3,0)**
This course introduces students to the fundamentals of applied multivariate statistics. As such, the course covers factor analysis, multiple regression analysis, discriminant analysis, analysis of variance and hypothesis testing.		

BADM 420	**Quantitative Methods for Business**	**3(3,0)**
This course introduces students to managerial decision analysis using quantitative tools. The course will introduce students to the practice of using and building mathematical models that would help managers make informed decisions. Focus is on the applied aspects of statistics and math. As such, the course will cover the basics of probabilistic and statistical techniques, decision analysis, linear programming, optimization, forecasting, and waiting-line theory. **Prerequisite**: BADM 250 or MATH 351.		

BITM 350	**Fundamentals of Data Analytics**	**3(3,0)**
This course introduces students to the statistical techniques used to analyze large datasets. The course covers the theory and application of both parametric and nonparametric methods. Students will learn how to visualize the data using both univariate and bivariate plots, how to use factor and cluster analysis in order to investigate whether correlation exists in a multidimensional space, and how to build		

and test predictive models such as linear regression models, logistic regression models, and time-series models. Prerequisite: BADM 250. **Prerequisite**: BADM 250.

BITM 415	**Business Intelligence**	**3(3,0)**
This course introduces business intelligence as computerized support for managerial decision-making. It concentrates on the theoretical and conceptual foundations of business intelligence as well as on commercial tools and techniques available for effective decision-support. It focuses on extracting business intelligence from data sets for various applications including reporting and visual analytics in multiple domains including web analytics and business analytics to aid decision-making processes. Provides hands-on experience with a variety of business intelligence software for reporting and building visualizations and dashboards**. Prerequisite**: Senior Standing & BADM 350		

BMKA 420	**Digital and Social Media Marketing**	**3(3,0)**
Digital marketing has evolved from a peripheral element of organizational marketing to one that is the hub of customer-centric communications in an increasingly multi-channel environment. This course covers the essentials of digital marketing topics, such as social media, email and mobile marketing, search engine optimization, paid search, and content marketing. It explains the principles of digital marketing together with the major factors involved with implementation, measurement, and evaluation of successful campaigns that utilize digital marketing channels. Prerequisite: Senior Standing		

CCEE 516	**Advanced Programming and Database Management Systems**	**3(3,0)**
This course will introduce students to managing their own databases and query them, and to manage Data Warehousing. Students will also learn advanced programming tools including bigtable, NoSQL, R, Python, SCALA, mapreduce, ElasticSearch and apply these tools to address big data issues. **Prerequisite**: CCEE 315 or equivalent.		

CCEE 561	**Computer Vision**	**3(3,0)**
This course introduces the principles, models, and applications of computer vision. The course will cover image structure, projection, stereo vision, and the interpretation of visual motion. Case studies of industrial (robotic) applications of computer vision, including visual navigation for autonomous robots, robot hand-eye coordination and novel man-machine interfaces. **Prerequisite**: CCEE 214 or COSC 214.		

CCEE 566	**Natural Language Processing**	**3(3,0)**
This course introduces the student to the area of natural language processing (NLP). The student is first introduced to word and sentence tokenization. The student then uses the learned skills to implement systems for text classification and sentiment analysis, spelling correction, information extraction, parsing, meaning extraction, and		

question answering, Machine learning algorithms as well as algorithms like n-gram language modeling, naive Bayes and maxent classifiers, sequence models like Hidden Markov Models, probabilistic dependency and constituent parsing, and vector-space models of meaning will be introduced as needed for the above NLP applications. **Prerequisite**: CCEE 214.

CCEE 567	**Optimization**	**3(3,0)**
This course introduces students to the theory, algorithms, and applications of optimization. The optimization methodologies include linear programming, network optimization, integer programming, and decision trees. It Includes a team project in which students select and solve a problem in practice. **Equivalent to**: BADM 420 and MECH 571. **Prerequisite**: Math 211 or equivalent.		

CCEE 568	**Big Data and Analytics/Big Data System**	**3(3,0)**
This course enables students to understand why the Big Data Era has come to be. Students will become conversant with the terminology and the core concepts behind big data problems, applications, and systems. Students will learn how to make Big Data useful in their business or career. Students will be introduced to one of the most common frameworks, Hadoop, that has made big data analysis easier and more accessible -- increasing the potential for data to transform our world. **Prerequisite**: CCEE 564 or equivalent.		

CCEE 612	**Advanced Data Mining**	**3(3,0)**
In this course advanced data mining topics will be covered, namely: classification (linear discriminant analysis, quadratic discriminant analysis, neural networks), combining multiple learners (bagging, boosting, cascading, stacking), dimensionality reduction (principal component analysis, linear discriminant analysis, subset selection), deep learning, anomaly detection, and reinforcement learning. **Prerequisite**: CCEE 564 or equivalent.		

COSC 214	**Introduction to Programming**	**3(2,2)**
This course presents the fundamentals of structured and modular programming concepts. It covers primitive data types, expressions, control statements, functions, arrays, basic searching/sorting algorithms, and introduction to pointers. **Prerequisite**: None. Equivalent to CCEE 214.		

COSC 316	**Design and Analysis of Algorithms**	**3(3,0)**
This course consolidates algorithm design and programming techniques. It provides an extended study of Object-Oriented Programming properties, data structures and data abstraction, and an introduction to complexity consideration. **Prerequisite***:* COSC 215.		

COSC 333	**Web Programming**	**3(3,0)**
This course teaches students how to develop and implement web-based programs with emphasis on front-end programming. It introduces students to web development and		

to different client-side languages and styles needed to develop adequate and responsive websites. The course covers HTML5, CSS3, JavaScript/jQuery and responsive design. **Prerequisite***:* COSC 214 Equivalent to CCEE 411.

COSC 480	**Machine Learning and Data Mining**	**3(3,0)**
This course introduces students to the basic knowledge representation and learning techniques. The emphasis consists of understanding the data mining process, as well as being able to practically apply the corresponding approaches in solving practical problems and developing intelligent software applications. The course covers several topics that lie within classification, prediction, and clustering. **Prerequisites***:* COSC 214; MATH 351 or BADM 250. Equivalent to CCEE 564.		

COSC 481	**Artificial Intelligence**	**3(3,0)**
This course introduces students to the basic knowledge representation and learning methods of artificial intelligence. The emphasis will be on understanding the fundamental artificial intelligence concepts, as well as being able to practically apply the corresponding approaches in solving practical problems and developing useful software applications. Covered topics include Intelligent agents, informed and uninformed search strategies, and adversarial search. The python language libraries will also be introduced. **Prerequisite**: COSC 214. Equivalent to CCEE 562.		

COSC 482	**Data Science and Web Scraping**	**3(3,0)**
Data is becoming the fuel of the 21st century, and acquiring any skill related to data processing and analysis is becoming a must. In this course, we introduce data science processes with a focus on web scraping as an application. The course will combine different domains, i.e., web programming, system programming, and machine learning. In particular, the course focuses on analyzing the HTML code of webpages using python, analyze the available information, and generate dashboards. Co-requisite: COSC 333 (or CCEE 411) and MATH 351 (or BADM 250).		

MATH 351	**Probability and Statistics**	**3(3,0)**
Probability and conditional probability, Discrete and continuous random variables, marginal distributions, expectation, variance-mean-median-covariance and correlation, conditional expectation, binomial, multinomial and Poisson distributions, Normal distribution, Sampling distribution, Prediction and confidence intervals, Hypothesis testing. Prerequisite: MATH 211.		

HEALTHCARE INFORMATION SYSTEMS PROGRAM (HCIS)

Mission

The mission of the Healthcare Information Systems program is devoted to providing students with a state-of-the-art curriculum, maintain persistent relationships with industry in order to create opportunities for students, cultivate learners with a sense of responsibility towards the profession and a passion for long life learning, and provide the educational experiences that will enable our students to be innovative generations.

Objectives

The program educational objectives of the Healthcare Information Systems program intend to enable its graduates within a few years of graduation to:

- Solve healthcare computing problems that meet local, regional, or global markets.
- Demonstrate professional skills and ethical behavior in practicing their profession
- Progress in computing and other professionally related fields at the level of professional employments or graduate studies

Program Outcomes

Upon successful completion of the BS degree in Healthcare Information Systems, graduates should demonstrate:

a. An ability to apply knowledge of health information systems and use current technologies, techniques, skills, and tools necessary for effective delivery of healthcare services appropriate to healthcare organizations;
b. An ability to apply health analytic methods to influence the planning, organizing, administering and policy creation of healthcare organizations;
c. An ability to design, implement, and evaluate healthcare systems, processes, and procedures to meet desired needs;
d. An ability to evaluate healthcare processes, practices, management of data, technologies, and conditions to ensure compliance with established quality and professional standards;
e. An ability to function effectively on teams to accomplish a common goal;
f. An understanding of professional, ethical, legal, security and social issues and responsibilities;
g. An ability to communicate effectively with a range of audiences.
h. Recognition of the need for and an ability to engage in continuing professional development.

Career Opportunities

With a Healthcare Information Systems degree, students will gain the foundational knowledge for the development and application of information technologies and systems in meeting the growing needs of healthcare organizations. Given the importance of information accuracy, privacy and security, HCIS graduates will be prepared for involvement in regulatory compliance and quality assessment activities designed to ensure that health information systems support patient care and safety. HCIS graduates can work with nurses, physicians, other healthcare providers, managers and technical specialists in a variety of settings such as hospitals, long-term-care facilities, insurance and managed care organizations, government agencies and vendor firms.

Program Overview

RHU's Healthcare Information Systems (HCIS) program combines concepts of healthcare, information technology, and leadership practice to prepare graduates with the required knowledge and skills to be valuable designers and developers of health information systems. HCIS program at RHU develops students' computational and critical thinking skills to create, not simply use, new healthcare technologies and systems. Students learn how to think and solve problems in a logical way by acquiring the fundamentals principles of sciences as well as advanced techniques that are currently used for practical systems development. They also learn oral communication and presentational proficiencies, as well as how to work on individual and team projects to develop new systems which enhance time management and team coordination skills. Graduates of RHU's HCIS program are lifetime learners; they canadapt quickly to this ever-changing challenging field.

To obtain a Bachelor of Science degree in HCIS, the student must complete a total of 100 credit hours. These hours span University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours is shown in the following table:

BS in Healthcare Information Systems (100 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	9	–	12	9	30	30
College Requirement	–	–	–	–	–	–
Program Requirement	42	9	19	–	70	70
Credits	51	9	31	9	100	100

I. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Arts and Sciences section in this catalog.

II. College Requirements

The list of the College required courses and their descriptions are presented in the introductory pages of the College of Arts and Sciences section in this catalog.

III. Program Requirements

A. Mandatory Requirements

Mathematics
The mathematics requirement courses are listed in the table below.

Course #	Title	Credits	Prerequisites
MATH 210	Discrete Mathematics	3	
MATH 211	Calculus III	4	
MATH 311	Linear Algebra	3	
MATH 421	Numerical Analysis	3	MATH 311

Business Requirements
The business requirement courses are listed in the table below.

Course #	Title	Credits	Prerequisites
BMGT 300	Project Management	3	Junior Standing
BMKA 200	Introduction to Marketing	3	Co-req.: ENGL 210

Major Requirements
The HCIS mandatory core courses are listed in the table below.

Course #	Title	Credits	Prerequisites
COSC 215	Advanced Programming and Data Structures	3	COSC 214
COSC 231	Database Management Systems	3	COSC 214
COSC 316	Design and Analysis of Algorithms	3	COSC 215
COSC 333	Web Programming	3	COSC 214
COSC 341	Software Engineering	3	COSC 214
COSC 360	Networking	3	COSC 214
COSC 360L	Networking Lab	1	COSC 360
COSC 480	Machine Learning and Data Mining	3	COSC 214; MATH 351 or BADM 250
HCIS 240	Medical Terminology	3	
HCIS 341	Health Information Systems I	3	BIOL 210
HCIS 342	Health Information Systems II	3	HCIS 341

HCIS 343	Information Security and Privacy in Healthcare	3	HCIS 341
HCIS 399	Co-op Training Experience	1	ENGL 217; Senior Standing.
HCIS 444	Healthcare Business Intelligence & Data Analysis	3	HCIS 341
HCIS 445	Research in Healthcare Information Systems	1	Senior Standing
HCIS 490	Summative Learning Experience	3	ENGL 217

B. Technical Electives

As part of the program for the Bachelor of Science in Healthcare Information Systems (HCIS), the student is required to study 9 credit hours of technical elective courses. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. The student can also mix and match elective courses from the different areas to get a more general exposure to the different HCIS disciplines. The student should select, in cooperation with the academic advisor, the list of electives that best meet his or her needs and aspirations. The listed technical elective courses and other courses from engineering programs, in addition to the required program courses, are designed to allow the student to develop in-depth knowledge and understanding in areas of interest.

Course #	Title	Credits	Prerequisites
BIOM 520	Health-care Facility Management	3	HCIS 341
BIOM 565	Introduction to E-Healthcare	3	HCIS 341
COSC 434	Advanced Web Programming	3	COSC 231 and COSC 333
COSC 435	Mobile Application Development	3	COSC 214; Senior Standing
COSC 436	Game Programming	3	COSC 214
COSC 438	Introduction to Software Testing	3	COSC 341
COSC 451	Operating Systems	3	COSC 214
COSC 461	Advanced Networking	3	COSC 360
COSC 463	Cybersecurity Operations	3	COSC 360
COSC 481	Artificial Intelligence	3	COSC 214
COSC 482	Data Science and Web Scraping	3	Co-req.: COSC 333 and MATH 351
COSC 498	Special Topics	3	
HCIS 498	Special Topics	3	Senior Standing
CCEE 561	Computer Vision	3	COSC 214
CCEE 566	Natural Language Processing	3	COSC 214

* List of electives courses is subject to change.

In addition, the students can take the following three labs instead of one elective.

Course #	Title	Credits	Prerequisites
Networking			
COSC 460L	Networking Lab 2	1	Co-req.: COSC 360L
COSC 461L	Networking Lab 3	1	COSC 460L
COSC 462L	Networking Lab 4	1	Co-req.: COSC 461L

C. Summative Learning Project

Students must complete a 3- credit hours course in which they work preferably in groups on a problem of concern to industry or the community at large, or to innovate a promising idea. The SLP could be an extension of the projects students had worked on in the Engineering for the community course to bring it to a more useful outcome.

D. Co-op Training Experience

Each student must complete 8 weeks of practical training in an area related to his/her field of interest. The Co-op experience is usually fulfilled during the summer semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member is assigned to mentor the student and follow up on his/her progress throughout the Co-op period by conducting field visits and ensure alignment of the student's performance with his/her aspirations and employer's needs. Students are required to submit a formal report, a poster and make a formal presentation about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to require stipulate additional conditions.

Course Coding

The courses offered in the HCIS program are designated code numbers in the form of (HCIS abc) where:

a	Designate the year (level)
b	Designate focus area as follows: 1. Software Engineering and Quality Assurance; 2. Network Administration and Security; 3. Healthcare
c	Course the course sequence in a focus area

Study Plan

The Bachelor of Science in Healthcare Information Systems encompasses 100 credit hours that are spread over 6 semesters and two summer sessions. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Fall Semester (16 Credits)			
ARAB 212	Arabic Language and Communication	2	
BMKA 200	Introduction to Marketing	3	Co-req.: ENGL 210
CMNS 200	Etiquette	1	Co-req.: ENGL 210
COSC 214	Introduction to Programming	3	
ENGL 210	English Composition and Rhetoric	3	Placement
MATH 211	Calculus III	4	
Year 1, Spring Semester (15 Credits)			
COSC 215	Advanced Programming and Data Structures	3	COSC 214
COSC 231	Database Management Systems	3	COSC 214
ENGL 217	Professional English Communication	3	ENGL 210
HCIS 240	Medical Terminology	3	
MATH 210	Discrete Mathematics	3	
Year 1, Summer Semester (6 Credits)			
BIOL 210	Human Anatomy and Physiology and Lab	3	
	Social Science/Culture Elective I	3	
Year 2, Fall Semester (16 Credits)			
COSC 316	Design and Analysis of Algorithms	3	COSC 215
COSC 333	Web Programming	3	COSC 214
COSC 360	Networking	3	COSC 214
COSC 360L	Networking Lab	1	Co-req.: COSC 360
HCIS 341	Health Information Systems I	3	
MATH 351	Probability and Statistics	3	MATH 211
Year 2, Spring Semester (15 Credits)			
COSC 341	Software Engineering	3	COSC 214
HCIS 342	Health Information Systems II	3	HCIS 341
HCIS 343	Information Security and Privacy in Healthcare	3	HCIS 341
MATH 311	Linear Algebra	3	
	HCIS Major Elective I	3	
Year 2, Summer Semester (1 Credits)			
HCIS 399	Co-op Training Experience	1	ENGL 217; Senior Standing
Year 3, Fall Semester (15 Credits)			
MATH 421	Numerical Analysis	3	MATH 311
GRDS 440	Design and Social Impact	3	
HCIS 444	Healthcare Business Intelligence and Data Analysis	3	HCIS 341
	Humanities/Fine Arts Elective	3	
	HCIS Major Elective II	3	

Year 3, Spring Semester (16 Credits)			
BMGT 300	Project Management	3	Junior Standing
COSC 480	Machine Learning and Data Mining	3	COSC 214; MATH 351 or BADM 250
HCIS 490	Summative Learning Experience	3	ENGL 217
HCIS 445	Research in Healthcare Information Systems	1	Senior Standing
	HCIS Major Elective III	3	
	Social Sciences/Culture Elective II	3	

Courses Description

I. Mandatory Courses

Descriptions of the major mandatory courses are given below.

COSC 214	**Introduction to Programming**	**3(2,2)**
This course presents the fundamentals of structured and modular programming concepts. It covers primitive data types, expressions, control statements, functions, arrays, basic searching/sorting algorithms, and introduction to pointers. **Prerequisite**: None. Equivalent to CCEE 214.		

COSC 215	**Advanced Programming and Data Structures**	**3(2,2)**
A continuation of COSC 214, this course covers the basics of Object-Oriented Programming (OOP) languages and data structures. It covers pointers, classes, encapsulation, constructors/destructors, object instantiation, and templates. The course also covers a detailed study of data structures and applications such as stacks, queues, lists, and trees. **Prerequisite***:* COSC 214. Equivalent to CCEE 216.		

COSC 231	**Database Management Systems**	**3(3,0)**
This course exposes students to the fundamental concepts necessary for designing, using and implementing database systems. It covers database concepts, data modeling, relations, normalizations, and data manipulation languages. **Prerequisite***:* COSC 214. Equivalent to CCEE 315.		

COSC 316	**Design and Analysis of Algorithms**	**3(3,0)**
This course consolidates algorithm design and programming techniques. It provides an extended study of Object-Oriented Programming properties, data structures and data abstraction, and an introduction to complexity consideration. **Prerequisite***:* COSC 215.		

COSC 333	**Web Programming**	**3(3,0)**
This course teaches students how to develop and implement web-based programs with emphasis on front-end programming. It introduces students to web development and to different client-side languages and styles needed to develop adequate and		

responsive websites. The course covers HTML5, CSS3, JavaScript/jQuery and responsive design. **Prerequisite***:* COSC 214. Equivalent to CCEE 411.

COSC 341	**Software Engineering**	**3(3,0)**
This course provides a deep and comprehensive understanding of the fundamentals of software engineering. The course initiates students to the different software process models, project management, software requirements, and engineering process. The course covers SDLC stages, UML diagrams, and the use of CASE tools. **Prerequisite***:* COSC 214. Equivalent to CCEE 310.		

COSC 360	**Networking**	**3(3,0)**
This course enables students to gain fundamental knowledge of computer networks, appreciate various tradeoffs and choices in networking, learn to design and analyze protocols, and get ready for studying advanced topics in the field of networks. **Prerequisite***:* COSC 214. Equivalent to CCEE 354*.*		

COSC 360L	**Networking Lab**	**1(0,2)**
This Lab helps prepare students seeking to pass advanced Cisco Certifications. The student will acquire the knowledge of the functionalities of network equipment and protocols, learn how to build a simple Ethernet network using routers, switches and computers, and use router CLI commands to perform basic configuration and verification. The student will also learn valuable network problem solving techniques and concepts. Accompanying Lab for COSC 360. **Co-requisite**: COSC 360.		

COSC 480	**Machine Learning and Data Mining**	**3(3,0)**
This course introduces students to the basic knowledge representation and learning techniques. The emphasis consists of understanding the data mining process, as well as being able to practically apply the corresponding approaches in solving practical problems and developing intelligent software applications. The course covers several topics that lie within classification, prediction, and clustering. **Prerequisites**: COSC 214; MATH 351 or BADM 250. Equivalent to CCEE 564.		

HCIS 240	**Medical Terminology**	**3(3,0)**
This course introduces elements of medical terminology such as foundations of words used to describe the human body and its conditions, terminology for medical procedures, and names of commonly prescribed medications. Spelling, pronunciation, and meanings of terms used in a professional healthcare system are covered in addition to the recognition of common abbreviations. **Prerequisite**: None.		

HCIS 341	**Health Information Systems I**	**3(3,0)**
This course introduces healthcare medical and business processes from a software design perspective. Topics include history of – and current topics related to – the healthcare delivery process; healthcare functions supported by hospital IT departments; and interaction between healthcare and business data domains and medical and allied health professionals.		

HCIS 342	Health Information Systems II	3(3,0)
In this course, students explore current technologies, regulations, and standards, including picture archiving and communication systems (PACS); the Health Insurance Portability and Accountability Act (HIPAA); 21CFR Part 11; FDA General Principles of Software Validation; and Health Level Seven (HL7), and examine their effects on software development. Other topics include information technologies used to store data, maintain data quality, ensure safety, and enforce security, and electronic health record systems. **Prerequisite:** HCIS 341.		

HCIS 343	Information Security and Privacy in Healthcare	3(3,0)
This course is designed to provide students with an introduction to current and emerging issues in healthcare information security, privacy, and regulatory compliance. It also provides the students with a substantive overview and analysis of relevant information security subject matter that is having a direct and material impact on the healthcare system. **Prerequisite**: HCIS 341.		

HCIS 399	Co-op Training Experience	1(1,0)
Each student must complete 8 weeks of practical training in an area related to his/her field of interest. This Co-op work experience is usually fulfilled during the summer semester of the third year into the program. Students are required to submit a formal report, and/or poster, and make a formal presentation about their Co-op experience. **Prerequisites**: ENGL 217; Senior Standing.		

HCIS 444	Healthcare Business Intelligence and Data Analysis	3(3,0)
This course enables students to learn how Healthcare Analytics and Health Information Exchange (HIE) solutions can help uncover new opportunities for growth, as well as gain an advantage in the profitable healthcare technology market. Other areas covered include how to provide quality patient care while complying with government regulations and controlling costs; and how to increase your organization's visibility in a crowded healthcare field. **Prerequisite**: HCIS 341.		

HCIS 445	Research in Healthcare Information Systems	1(1,0)
This course focuses on current research trends in the field of healthcare information systems. It may incorporate technical seminars, advanced readings and special projects as required/approved by the department. **Prerequisite:** Senior Standing.		

HCIS 490	Summative Learning Experience	3(3,0)
This is a graduation project directed on individual problems and research. Each student will have to complete it in her/his emphasis area. **Prerequisite:** ENGL 217.		

Business Required Courses

The HCIS program requires two business courses, BMKA 200 and BMGT 300 described below.

BMGT 300	Project Management	3(3,0)
This course provides the students with the necessary skills to manage their business projects using effective techniques in leading, organizing, scheduling, and controlling the tasks contributing to the project goals. Topics include selection and statement of work of projects; skills of project managers and task break down structure, PERT/CPM scheduling and budgeting, **Prerequisite:** Junior Standing.		

BMKA 200	Introduction to Marketing	3(3,0)
This course introduces the basic principles, theories, and practices of marketing in our modern ever-changing business environment. The course covers the marketing process activities on how to create value for customers to capture value from customers in return. It also discusses the marketing mix and how to build long-term customer relationships with customers. Students will analyze case studies about a "real-life" product or service. Videos and in-class discussions on current marketing topics will assist in the learning experience. **Co-requisite**: ENGL 210		

II. Elective Courses

Descriptions of the major elective courses are given below.

COSC 434	Advanced Web Programming	3(3,0)
This course is a continuation of the web-programming course and trains students to become full stack developers. It allows students to get to know how to develop back-end programs, connect their website or web application to a database, use regular expressions, develop asynchronous client access to server data, work with structured data formats such as JSON, as well as working with a third-party medium like web services. **Prerequisite:** COSC 231 and COSC 333. Equivalent to CCEE 514		

COSC 435	Mobile Application Development	3(2,2)
This course examines the principles of mobile application design, development, and testing. It covers memory management, user interface design, input methods, data handling, and network techniques. Students are expected to work on a project that produces a professional-quality mobile application. Projects will be deployed in real-world applications. **Prerequisites**: COSC 214, Equivalent to CCEE 511		

COSC 436	Game Programming	3(2,2)
This course presents an overview of the software technologies related to game development. It provides the students with a conceptual understanding of the field of game design along with practical exposure to the process of creating a game. **Prerequisites**: COSC 214, Senior standing.		

COSC 438	Introduction to Software Testing	3(3,0)
This course will introduce the students to the field of software testing; its importance, goals, approaches, and major player's roles (developers, testers, and users). Students will learn about software testing life cycle, standards, types of testing (manual vs automated testing), testing methods (black box vs white box), testing levels (functional,		

unit testing…), and documentation. A hands-on experience of automated testing tools will also be covered in this course. **Prerequisite***:* COSC 341.

COSC 451	Operating Systems	3(3,0)
Students learn the concepts of operating systems theory and their implementations. Covered topics include computer and operating system structures, process and thread management, process management and synchronization, deadlocks, security and protection, inter-process communication, memory management, and I/O control system. A case study of a UNIX operating system will accompany the course. **Prerequisites:** COSC 214. Equivalent to CCEE 513.		

COSC 460L	Networking Lab 2	1(0,2)
This Lab helps prepare students seeking to pass Cisco - Routing and Switching Essentials (CCNA 2) Certifications. The primary focus of this Lab is routers and switches in small networks. The student will learn the architecture, components, and operations of routers and switches, in addition to their configuration with basic functionalities. They will also learn how to configure and troubleshoot static and dynamic routing protocols, access control lists, VLAN, DHCP for IPv4 and IPv6 networks, and NAT operations. **Co-requisite**: COSC 360L.		

COSC 461	Advanced Networking	3(3,0)
This course prepares students to act as a System and Network Administrator by implementing Active Directory Directory Service ADDS in distributed environments that can include complex network services and domain controllers. The covered materials assist students to efficiently automate the administration of users, groups, and computers. **Prerequisite**: COSC 360.		

COSC 461L	Networking Lab 3	1(0,2)
This Lab helps prepare students seeking to pass Cisco - Routing and Switching Essentials (CCNA 3) Certifications. The primary focus of this Lab is routers and switches in large and complex networks. The student will learn how to configure routers and switches with advanced functionalities. They will also learn how to configure and troubleshoot enhanced switching technologies, first hop redundancy protocol in a switched network, wireless routers and clients, and routers in complex networks. Finally, they will learn how to manage CISCO IOS software licensing and configuration files. **Prerequisite**: COSC 460L.		

COSC 462L	Networking Lab 4	1(0,2)
This Lab helps prepare students seeking to pass Cisco – Connecting Networks (CCNA 4) Certifications. The primary focus of this Lab is Wide Area Network (WAN) technologies and the services provided by complex networks to support converged applications. The student will learn how to configure and troubleshoot routers for WAN, NATing for IPv4 network, serial, and broadband connections, tunneling operations, and monitoring Site-to-site connectivity with highlight on security. They will also learn how to configure and troubleshoot network management operations using syslog, SNMP,		

and Netflow. Finally, they will understand virtual private network (VPN) benefit and operations, borderless networks' architecture, data centers and virtualization architecture, and collaboration technologies and solution. **Co-requisite**: COSC 461L.

COSC 463	**Cybersecurity operations**	**3(3,0)**
This course is a hands-on, career-oriented course that focuses on practical topics to prepare students to acquire the required skills to work in cybersecurity domain. The course will help students seeking to pass Cybersecurity Operation Associate CISCO Certification. **Pre-requisite**: COSC 360 (or CCEE 354).		

COSC 481	**Artificial Intelligence**	**3(3,0)**
This course introduces students to the basic knowledge representation and learning methods of artificial intelligence. The emphasis will be on understanding the fundamental artificial intelligence concepts, as well as being able to practically apply the corresponding approaches in solving practical problems and developing useful software applications. Covered topics include Intelligent agents, informed and uninformed search strategies, and adversarial search. The python language libraries will also be introduced. **Prerequisite**: COSC 214. Equivalent to CCEE 562.		

COSC 482	**Data Science and Web Scraping**	**3(3,0)**
Data is becoming the fuel of the 21st century, and acquiring any skill related to data processing and analysis is becoming a must. In this course, we introduce data science processes with a focus on web scraping as an application. The course will combine different domains, i.e., web programming, system programming, and machine learning. In particular, the course focuses on analyzing the HTML code of webpages using python, analyzing the available information, and generating dashboards. Co-requisite: COSC 333 (or CCEE 411) and MATH 351 (or BADM 250).		

HCIS 498	**Special Topics in Healthcare**	**1-3 credits**
A special topic course to be defined based on current trends and departmental special interests. It may incorporate technical seminars, advanced readings and special projects as required/approved by the department. **Prerequisite**: Senior standing.		

MINOR IN MATHEMATICS

Rationale

The CIS department offers a minor in Mathematics for RHU students. It is designed to give students a solid foundation in mathematics as well as some experience in the discipline at an advanced level.

Program Objectives

The aims of a minor in Mathematics are:

- Provide RHU graduates with a basic proficiency in Mathematics to compete at the university level.
- Support RHU graduates with essential mathematical skills to enhance their knowledge and understanding in their respective majors.

Learning Outcomes

At the end of this minor, the student is expected to demonstrate:

- An ability to analyze mathematically experimental or physical results
- An ability to use mathematical techniques, skills, and facts in their respective research

Entrance Requirements

Interested RHU students need to fill in the appropriate form declaring that they will be minoring in Mathematics while completing their regular major.

Mathematics Minor Policies

- Obtain a Minor Cumulative Grade Point Average of no less than 70 %.
- Up to four courses between student major requirements and mathematics minor requirements are counted to fulfill the mathematics minor requirements

Career Options

This minor allows its holders to seek careers in a variety of sectors no matter what a student's major is. Graduates from this minor can seek jobs related to teaching, banking and finance, computing, and statistical works.

Program Requirements

To successfully complete the Minor in Mathematics, a student must

1) Declare a Minor in Mathematics by completing the Minor Declaration Form;
2) Obtain the approval of the dean of the college major and the dean of CAS
3) Obtain a Minor Cumulative Grade Point Average of no less than 70 %.
4) Complete 19 credits of Mathematics coursework as specified below.

Curriculum and Program

The Mathematics minor consists of six courses (19 credits) in which three are mandatory and three are electives, selected to satisfy the requirements of the proposed program objectives and learning outcomes.

I. Mandatory Courses

The three mandatory courses (10 Cr.) are:

Course #	Title	Credits	Prerequisites
MATH 211	Calculus III	4	
MATH 311	Linear Algebra with Applications	3	
MATH 314	Ordinary Differential Equations	3	MATH 211

II. Elective Courses

The elective courses will be chosen with the Mathematics minor advisor based on students' needs and background. Students may choose three elective courses (9 credits) from the following list.

Course #	Title	Credits	Prerequisites
MATH 210	Discrete Mathematics	3	
MATH 215	Advanced Calculus	3	MATH 211
MATH 316	Introduction to Analysis	3	MATH 215
MATH 317	Partial Differential Equations	3	MATH 314
MATH 318	Vector Calculus	3	MATH 215 & MATH 311
MATH 351	Probability and Statistics	3	MATH 211
MATH 421	Numerical Analysis	3	MATH 311
MATH 425	Introduction to Complex Variables	3	MATH 215
MATH 442	Introduction to Graph Theory	3	MATH 316, MATH 210

DESIGN DEPARTMENT (DD)

Faculty Members

Chairperson:	Serene Srouji
Associate Professor:	Serene Srouji
Lecturer:	Noura Sammoura
Adjunct Faculty:	Karen Khodur, Larissa Vasilchenko, Lina Hassoun, Rahaf Ghader, Rihab Zebian, Saber Abdallah.

Vision

The Design Department at Rafik Hariri University strives to be the leader in high standard, progressive education in Lebanon and the region. It aims at developing creative, well-informed, skilled professionals aware of their responsibility in solving visual problems in a dynamic global society. Our vision is a future where RHU faculty, students, and alumni become trendsetters and innovators in the design world, both theoretically and practically.

Programs Offered

The Department of Design currently offers one program leading to a Bachelor of Science degree in Graphic Design. It also offers a minor in Graphic Design. Details of each program will follow.

GRAPHIC DESIGN PROGRAM

Mission

Our mission is to educate students to become successful thinkers and creative designers who can enhance human experience and improve communication. This is achieved through:

- Providing high standard teaching methods and progressive curricula that deliver professional excellence.
- Educating designers to be socially and ethically responsible to serve for a better community.
- Promoting growth and innovation both personally and academically to become successful leaders in the workplace.
- Mentoring students to tackle design challenges with a creative innovative approach while adhering to design principles.
- Providing students with coverage through diverse media forums, exhibitions, and events.
- Providing students with design perspectives from designers and thinkers outside of RHU through juries, workshops, lectures, and seminars.
- Establishing and maintaining close relationships with the industry and other academic institutions to improve the curriculum, expand collaboration and increase job opportunities for our students.

Objectives

- Provide students with both print and multi-media design courses.
- Provide students with the necessary thinking, planning and execution skills to succeed in the workplace.
- Provide students with technologically advanced skills in new fields such as VR, AR, 3D Printing…
- Provide students with the key elements to develop a portfolio and CV that stands out in the market.
- Allow students to explore various platforms through personal creative skills.
- Emphasize both theoretical and practical aspects of design, which will in turn present a complete understanding of the design field.
- Explore the diverse roles of designers as effective visual creators, ethical and social beings and problem solvers.

Program Outcomes

Upon successful completion of the BS program in Graphic Design, graduates will:

- Effectively communicate messages through the juxtaposition of images and type to a specific target audience.
- Acquire, articulate, and apply specialized terminology and knowledge relevant to graphic design including relationships to other disciplines and to contemporary global issues.
- Implement creative solutions from concept through completion using a formal process.
- Display competency in technical skills applicable to graphic design.
- Demonstrate the ability to use design-thinking strategies in an iterative design process.
- Apply the principles of design to develop strategic marketing and communication solutions to companies, products, and services.
- Be able to analyze, synthesize, and develop successful solutions.
- Become conceptual thinkers aware of social, cultural, and ethical issues…
- Access information through traditional and new technologies and synthesize this information for problem solving activities.
- Understand the relationship of graphic design to other disciplines and to society.
- Develop a professional resume, business card, and portfolio, as well as learn how to conduct a job search. They will also gain familiarity with the types of jobs available in the graphic design industry.

Career Opportunities

Graphic designers attain a broad spectrum of knowledge and skills that highly equip them to enter the professional field. Graphic Design opens vast opportunities in various fields that include TV stations, advertising agencies, design and packaging firms, editorial firms and magazines, branding agencies, interactive design firms (web and applications), 3D animation studios and gaming, photography studios, printing presses, illustration firms and publishing houses. Furthermore, a high number of NGOs, banks and other business companies require in-house graphic designers. In addition to working as a full-timer, freelance projects, both locally and internationally, are available for extra income and independent work due to high market demand.

Graphic Design also serves as an excellent foundation for careers in product management, marketing, and social media.

Program Overview

The Graphic Design (GRDS) Program at RHU provides excellent teaching standards based on academic and creative research as well as professional practice. The graphic design department at RHU presents students with a great opportunity to grow as individuals, nurture their unique style and increase their self-confidence. Various forums in the design field are explored and students are taught skills related to client communication and succeeding in the workplace.

The graphic design program is based on a student-centered approach where students gain extensive knowledge in design theory, and a thinking approach that is essential in all problem-solving issues. The program's curriculum, facilities and committed faculty members ensure students' academic and personal growth in an environment that inspires learning and drives creativity.

BS in Graphic Design (111 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	12	-	9	9	30	27
College Requirement	-	-	-	-	-	0
Program Requirement	51	6	21	3	81	73
Credits	63	6	30	12	111	100

I. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Arts and Sciences section in this catalog.

II. College Requirements

The diversity of the programs precludes the identification of college requirements that are common to all programs offered by the CAS.

III. Program Requirements

A. Fine Arts Requirements (18 credits)

As part of the program of the Bachelor of Science in Graphic Design, students are required to take 18 credit hours of Fine Arts requirement courses, which are listed in the table below. These courses build a solid artistic and technical foundation that help students excel in the design field.

Course #	Title	Credits	Prerequisites
FADR 200	Drawing I	3	
FADR 202	Drawing II	3	FADR 200
FADR 210	Rendering and Perspective Techniques	3	
FADR 215	History of Art	3	
FADR 220	Fundamentals of 2D	3	
FADR 222	Fundamentals of 3D	3	FADR 220

B. Business Requirement

The business requirement consists of a three-credit course listed in the table below.

Course #	Title	Credits	Prerequisites
BMKA 200	Introduction to Marketing	3	Co-req.: ENGL 210

C. Mandatory Requirements

The set of mandatory graphic design courses encompasses the 51 credits listed in the table below.

Course #	Title	Credits	Prerequisites
GRDS 203	Introduction to Graphic Design	3	GRDS 205
GRDS 205	Type I	3	GRDS 220
GRDS 222	Advanced Digital Media	3	GRDS 220
GRDS 230	Photography I	3	
GRDS 300	Illustration	3	GRDS 220, FADR 202
GRDS 305	Type II	3	GRDS 205
GRDS 306	Type III	3	GRDS 222, GRDS 305
GRDS 310	Design I	3	GRDS 203, GRDS 220
GRDS 311	Design II	3	GRDS 310
GRDS 345	History of Graphic Design	3	FADR 215
GRDS 399	Co-op Training Experience	1	ENGL 217; Senior Standing.
GRDS 409	Design Writing Research	3	GRDS 311; Co-req: GRDS 411
GRDS 411	Design III	3	GRDS 311, GRDS 306
GRDS 412	Design IV	3	GRDS 411, GRDS 409
GRDS 423	Motion Graphics	3	GRDS 220
GRDS 424	Web and Interactive Design	3	GRDS 423
GRDS 450	Branding and Advertising	3	GRDS 411
GRDS 452	Digital Illustration	2	GRDS 222, GRDS 300

D. Major Elective Requirements

Students are required to take 6 credit hours of major elective courses to increase their knowledge in innovative disciplines and current issues related to the field of design.

Course #	Title	Credits	Prerequisites
GRDS 320	UI/UX Design	3	GRDS 220
GRDS 330	Photography II	3	GRDS 230
GRDS 331	Digital Processing	3	GRDS 222
GRDS 350	3D Printing & Prototyping	3	GRDS 222
GRDS 355	Calligraphy	3	GRDS 305
GRDS 375	3D Animation	3	GRDS 423
GRDS 380	VR Illustration and Sculpting	3	GRDS 300
GRDS 381	Book Binding	3	Junior Standing

GRDS 402	Silkscreen	3	GRDS 300
GRDS 403	Painting	3	FADR 202
GRDS 436	Game Design	3	GRDS 220
GRDS 498	Special Topics in Graphic Design	3	

E. Social Science/Culture Requirement

Students are required to take 3 extra credit hours of social science/culture to fulfil the 5 courses of humanities and social sciences required for accreditation.

F. Co-op Training Experience

Each student must complete 8 weeks of practical training in an area related to his/her field of interest. The Co-op experience is usually fulfilled during the summer semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on student's progress throughout the Co-op period by conducting field visits to ensure that the student's performance is aligned with his/her aspirations and employer's needs. Students are required to submit a formal report, poster, and a formal presentation about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to require stipulate additional conditions.

Study Plan

The Bachelor of Science in Graphic Design encompasses 111 credit hours that are spread over 6 semesters and three summer sessions, the last of which is dedicated to the CO-OP experience. The following study plan serves as a roadmap for the student's smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Semester 1 (15 Credits)			
ENGL 210	English Composition & Rhetoric	3	Placement
GRDS 220	Introduction to Digital Media	3	
FADR 200	Drawing I	3	
FADR 215	History of Art	3	
FADR 220	Fundamentals of 2D	3	
Year 1, Semester 2 (15 Credits)			
GRDS 205	Type I	3	Co-req.: GRDS 220
GRDS 222	Advanced Digital Media	3	GRDS 220
FADR 202	Drawing II	3	FADR 200
FADR 210	Rendering and Perspective Techniques	3	
FADR 222	Fundamentals of 3D	3	FADR 220
Summer Session (9 credits)			
ARAB 212	Arabic Language and Communication	2	

CMNS 200	Etiquette	1	Co-req.: ENGL 210
GRDS 203	Introduction to Graphic Design	3	GRDS 205
GRDS 230	Photography I	3	
Year 2, Semester 1 (18 Credits)			
BMKA 200	Introduction to Marketing	3	Co-req.: ENGL 210
ENGL 217	Professional Communication Skills	3	ENGL 210
GRDS 300	Illustration	3	GRDS 220, FADR 202
GRDS 305	Type II	3	GRDS 205
GRDS 310	Design I	3	GRDS 203, GRDS 220
	Social Sciences/Culture Elective I	3	
Year 2, Semester 2 (15 Credits)			
GRDS 306	Type III	3	GRDS 222, GRDS 305
GRDS 311	Design II	3	GRDS 310
GRDS 423	Motion Graphics	3	GRDS 220
GRDS 335	Production	3	GRDS 222
GRDS 345	History of Graphic Design	3	FADR 215
Summer Session (9 Credits)			
GRDS 360	Visual Perception & Infographics	3	GRDS 311
	Social Sciences / Culture Elective II	3	
	Humanities/Fine Arts Elective	3	
Year 3, Semester 1 (15 Credits)			
GRDS 409	Design Writing Research	3	GRDS 311; Co-req: GRDS 411
GRDS 411	Design III	3	GRDS 311, GRDS 306
GRDS 424	Web and Interactive Design	3	GRDS 423
GRDS 440	Design & Social Impact	3	Junior standing
	Major Elective I	3	
Year 3, Semester 2 (14 Credits)			
GRDS 412	Design IV	3	GRDS 411, GRDS 409
GRDS 452	Digital Illustration	2	GRDS 222, GRDS 300
GRDS 450	Branding & Advertising	3	GRDS 411
	Social Sciences/Culture Elective III	3	
	Major Elective II	3	
Summer Session (1 Credit)			
GRDS 399	Co-op Training Experience	1	ENGL 217; Senior Standing

Courses Description

I. Mandatory Requirements

Fine Arts Courses

Descriptions of the Fine Arts Requirement courses are given below.

FADR 200	Drawing I	3(2,2)
This course is a comprehensive introduction to the art of drawing. Students learn how to represent accurately and proportionally objects, planes, and volumes by developing hand-to-eye coordination with lines, shades, and tones, as well as wet and dry media. The course introduces a wide range of drawing techniques, composition principles, perspective basics and various media to prepare students with the essential ingredients needed to grow in the design field.		

FADR 202	Drawing II	3(2,2)
This drawing course focuses on teaching students the basics of drawing the human figure by studying the human anatomy and its proportions. It emphasizes the use of the human figure in space as a compositional element. Students will explore the potential and limits of media and materials. Students will begin to form a personal approach to drawing and even develop a personal drawing/illustrating style. **Prerequisite**: FADR 200.		

FADR 210	Rendering and Perspective Techniques	3(2,2)
This course introduces students to perspective techniques in the rendering of three-dimensional objects, and scenes on two-dimensional surfaces. Students learn how to apply perspective drawing, composition, and conceptualization as a means of developing visual communication skills. Design, composition, light rendering, and perspective are explored to enhance the students drawing and rendering techniques.		

FADR 215	History of Art	3(3,0)
This course explores the major forms of artistic expression from the ancient world to the present from a variety of cultural perspectives. Students learn how to look at and analyze works of art within their historical context, and how to articulate what they see or experience in a meaningful way. This course covers Pre-Renaissance, Renaissance, Post Renaissance and the rich layers of 19th and 20th Century Modern Art up until the manifestations of our present day.		

FADR 220	Fundamentals of 2D	3(2,2)
This course focuses on the student's visual awareness through an introduction to the fundamentals of 2-D design elements, which include: line, texture, pattern, tone, form, color, light, partial illusion, balance, and proportion. Students also explore and experiment with design principles such as repetition, variety, emphasis, and movement. This course broadens the understanding of compositional devices, dynamics, and		

methods. It also aims at developing a clear understanding of visual organization, shape interaction and color theory.

FADR 222	Fundamentals of 3D	3(2,2)
This course is an extension of two-dimensional design concepts into volumetric relationships emphasizing design concepts through structural and sculptural form. Students will work in various media including paper, cardboard, wood, wires, metal and plaster to explore concepts of modularity, sequence and series, relief, contour, structure, symmetry and asymmetry as they relate to the study of forms in nature. Students will also examine the function of space, volume, mass, plane, and line. The main emphasis of this course is the development of critical thinking skills, technical skills and visual aesthetic skills. **Prerequisite**: FADR 220.		

Business Course Requirement

The Graphic Design program requires one business course, BMKA 200 described below.

BMKA 200	Introduction to Marketing	3(3,0)
This course introduces the basic principles, theories, and practices of marketing in our modern ever-changing business environment. The course covers the marketing process activities on how to create value for customers to capture value from customers in return. It also discusses the marketing mix and how to build long-term customer relationships. Students will analyze case studies about a “real-life” product or service. Videos and in-class discussions on current marketing topics will assist in the learning experience. **Co-requisite**: ENGL 210		

Major Graphic Design Courses

Description of the Graphic Design courses follows.

GRDS 203	Introduction to Graphic Design	3(3,0)
Graphic design is a creative process that combines art and technology to visually communicate ideas. This course introduces students to the discipline of graphic design by exploring the elements, principles, and design process. It focuses on the process of design from the initial stage of choosing a topic through the intermediary working stages till the final presentation. It is a theoretical course that includes practical exercises in visual communication, organization, and perception. Projects explore the various dimensions of design to fully comprehend its expressive power as a visually communicative tool and a problem-solving method. **Prerequisite**: GRDS 205.		

GRDS 205	Type I	3(3,0)
Type, characters, and letterforms are the essential building blocks of visual communication. In this course, students learn how to express ideas not only through the meaning of words but also through manipulating the shape of a typographic character, which improves the quality of information and communication. This introductory course teaches students the anatomy of type, essential type terminology, history of type categorization and standardization; as well as the difference between calligraphy and typography. **Prerequisite**: GRDS 220.		

GRDS 220	Introduction to Digital Media	3(3,0)
In this course, students will develop a solid foundation of Adobe Illustrator and Adobe Photoshop tools and techniques. Students will learn the difference between vector based and pixel-based programs and how to integrate both work fields to produce creative graphics. Moreover, students will receive a brief introduction about Adobe InDesign: workspace, function and tools.		

GRDS 222	Advanced Digital Media	3(3,0)
The first section of the course teaches students advanced tools and techniques in Adobe Illustrator (mesh 3D) and Adobe Photoshop (masks). The second part emphasizes learning technical skills in Adobe InDesign, which is a computer-based page layout software. Students will learn how to use master pages, style sheets, typographic controls, flowing and formatting text, placing, and manipulating images, combining images and text, creating tables, gradients, and PDF's, and correctly preparing digital files for offset printing. **Prerequisite**: GRDS 220.		

GRDS 230	Photography I	3(3,0)
This course teaches students the basics of black & white digital photography. It is a lecture-based course with extensive hands-on practical training. Students learn how to develop an eye for taking pictures and framing objects. They also enhance their knowledge about the different parts of a camera and the mechanism of printing and developing films while continuously scanning other photographers from contemporary and historical scenes.		

GRDS 300	Illustration	3(2,2)
This class is designed to introduce students to the art of illustration and visual story telling. It teaches students various technical skills to enhance their ideas and creativity. This class allows students to discover their personal style through line quality, colors, and shapes. Students will be aided to develop their own 'style' through visual analysis and personal visions. Hands on projects will help enhance ideas and techniques such as ink and brush, scraperboard, mono prints, watercolor, relief printing, and collage. **Prerequisites**: GRDS 220; FADR 202.		

GRDS 305	Type II	3(3,0)
This is an intermediate level course devoted to the study of the marriage of Latin and Arabic typography. This course develops the student's ability to create typographic designs by visually and aesthetically merging Arabic and Latin Fonts. This multi-script combination targets the needs of our direct Arab and Lebanese market. Students will learn how to dissect fonts, create modules, experiment with type, generate Arabic adaptations and construct typographical patterns that evolve into 3D objects. The student further learns the rules of the typographic grid system to be able to experiment with breaking the Grid while designing layouts, spreads, and posters. **Prerequisite**: GRDS 205.		

GRDS 306	Type III	3(3,0)
This course focuses on Arabic typography; its history and the modern approaches applied to enhance our Arabic fonts. Students will learn the anatomy of Arabic type to be able to creatively manipulate its parts. Projects will include the creation of: Experimental Display Arabic font, arabesques, Arabic graffiti, and Arabic adaptations. The skills acquired in previous type classes will give the students the necessary techniques to further explore how typography and mainly Arabic typography can function as a pure communicative tool. **Prerequisites**: GRDS 222; GRDS 305.		

GRDS 310	Design I	3(2,2)
This course is an investigation of the creative process that the designer goes through while designing the main elements of visual communication: symbols, pictograms, icons and logos. Students will be asked to create their own visual vocabulary (corporate identity) that has enough credibility to convince the target audience to purchase a certain service or product. It is an intensive insight into planning and developing a corporate image: logos and other business communication applications. In addition, students learn to design a complete restaurant branding image from initial concept to final execution. **Prerequisites**: GRDS 203; GRDS 220.		

GRDS 311	Design II	3(2,2)
This course provides a general overview of design principles for the structure and visual aspects of packaging design, as well as the history of packaging and the psychology of consumer decision-making. The imposition of graphic images and innovative diecuts of various packages and package materials will be examined. Key course concepts will include researching and designing 3D packages, understanding ecofriendly and sustainable packages, experimenting with playful and conceptual design packaging as well as defining the target audience to design the best solution for a package. **Prerequisite**: GRDS 310.		

GRDS 335	Production	3(3,0)
In this course, students will develop an understanding of the “process flow” in contemporary methods of print production. The course covers the entire timeline of production: Prepress-Press-Post Press. In addition to printing technologies, students will learn about various types of ink and paper, binding, varnishes, finishing techniques and the effect of the printing process on the product. Students will also learn how to handle projects and deal with clients as freelance designers or as designers working for companies. **Prerequisite**: GRDS 222.		

GRDS 345	History of Graphic Design	3(3,0)
This course covers the evolution of graphic communication from prehistory through postmodern design and the digital revolution. This course provides graphic design students with the knowledge and understanding of the places, people, and events; as well as historical and cultural factors and technological innovations that have influenced the development of graphic design into the practice known today. Historical awareness		

provides a meaningful context for young designers to evolve and contribute in positive ways to the cultures in which they live and work in. **Prerequisite**: FADR 215.

GRDS 360	**Visual Perception & Infographics**	**3(3,0)**
Visual perception is the ability to interpret information from our surroundings through visible light that reaches the eye. This course will explore the various theories of visual perception with an emphasis on Gestalt theory and its relation to Graphic Design. It will create an understanding of our human visual perception and its limitations. Students will also be given projects in which they will apply Gestalt principles and the learned theories. In addition to visual perception theories, students will learn 2 key disciplines in design: Infographics and Wayfinding. **Prerequisite**: GRDS 311.		

GRDS 399	**Co-op Training Experience**	**1(1,0)**
Each student must complete 8 weeks of practical training in an area related to his/her field of interest. This Co-op work experience is usually fulfilled during the summer semester of the third year into the program. Students are required to submit a formal report, and/or poster, and make a formal presentation about their Co-op experience. **Prerequisites***:* ENGL 217; Senior Standing.		

GRDS 409	**Design Writing Research**	**3(3,0)**
In this course, students will explore various research methodologies to acquire the necessary skills needed to write a well-rounded research paper for their final year design project. They will be exposed to the tools of visual analysis, which will enable them to articulate their understanding and appreciation of a given visual. Students will engage in writing exercises focused on various topics in the design field. By the end of this course, students should develop their senior project research proposal. **Prerequisite**: GRDS 310.		

GRDS 411	**Design III**	**3(2,2)**
This course prepares students for the design challenges faced in designing and producing professional-looking layouts in editorials (newsletters, reports, books, & magazines) and on screen (websites and web applications). Students learn how to create multi-page publications and on-screen interfaces with effective typography, images, illustrations, and layouts. The core focus of this course is working with user interactivity, composition, layout, format, negative space, grids, type, and graphical elements. **Prerequisite**: GRDS 311, GRDS 306.		

GRDS 412	**Design IV**	**3(2,2)**
This course focuses on creating a final year project that forges a bridge between the theory and practice of visual communication through the extensive exploration of the design process. Students will research, develop, and design their individual senior project to demonstrate their ability of visual communication. This class provides the students with a forum to showcase their talent and skills. Emphasis is placed on creativity and quality of work. **Prerequisite**: GRDS 411, GRDS 409.		

GRDS 423	Motion Graphics	3(3,0)
A rapidly expanding and thriving field, motion graphics gives designers new opportunities to work in television, film, and web design. This course focuses on motion graphics and its diverse methodologies to lay down the necessary specialized essentials. Adobe after Effects and Flash are utilized to teach the foundations of compositing, video editing and special effects. Assignments center on upholding a certain amount of experimentation and are process-oriented. Students will learn how to animate graphics and type as a technique to better communicate ideas visually. **Prerequisite**: GRDS 220.		

GRDS 424	Web and Interactive Design	3(3,0)
As the World Wide Web became a fundamental fixture of life, it became essential for design to play a vital role in ensuring that any interface is accessible, exciting, and effective. This course examines the constantly developing medium of User Interface and User Experience Design. It combines web and application design as a communication medium with a distinctive user experience. Instruction focuses on attaining a crucial equilibrium between form and function, and between visual design and effectiveness, as well as accessible navigation and communication. **Prerequisite**: GRDS 423.		

GRDS 440	Design and Social Impact	3(3,0)
This course prepares students to become leading agents of social change through community engagement. It aims at promoting collaborative work between computer science and graphic design students to design effective solutions to existent community issues. The course is structured on a balance between classroom theory learning, extensive field research and implementation of a real-world solution using both expertise. **Prerequisite:** Junior standing.		

GRDS 450	Branding & Advertising	3(3,0)
This course explains both branding & advertising and their relationship to each other. It explores the history of advertising and discusses the most influential and altering periods that advertising went through (from billboards to radio and TV and recently social media). It also emphasizes the importance of advertising in defining and differentiating a product within our contemporary mass market. This course includes hands on experience by applying advertising and branding concepts and techniques in a complete campaign: creating a product, finding its competitors, defining the target audience, writing the marketing research designing the package; as well as the ad campaign from press ads to billboards…). **Prerequisite**: GRDS 411.		

GRDS 452	Digital Illustration	2(1,2)
Digital illustration uses digital tools, software, and applications to create complex graphical illustrations and images. In this course, students will learn various techniques and directions to produce fresh creative aesthetical illustrations. Students will receive hands-on training with basic drawing/painting, manipulating and creating vector-based		

graphics, illustrations and digital paintings. Projects include various areas from comic strips to 3-D rendering. **Prerequisites**: GRDS 222; GRDS 300.

II. Elective Courses

Descriptions of the major elective courses are given below.

GRDS 320	**UI / UX Design**	**3(3,0)**
This course combines digital technology and creative design to create an interactive App prototype. It emphasizes efficient use of Adobe XD as a testing and prototyping tool. Students will be asked to implement digital design research methods in the study of User Experience from forming proto-personas, journey maps, site maps, red-routes, sketches, and wireframes which will then be transformed into a clickable application. In addition, students will learn to design a complete app design (Logo and In-App Screen designs) from A to Z. After the application design, students will implement the evaluation criteria to user-test the app for improvement. **Prerequisite**: GRDS 220.		

GRDS 330	**Photography II – Photography for Social Media**	**3(3,0)**
This course emphasizes the development of a critical eye and the use of photography as a form of self-expression and an artistic medium for social media and posts. Students are expected to have a working knowledge of the photographic process. Students will produce photographic posts for real life brand products. **Prerequisite**: GRDS 230.		

GRDS 331	**Digital Processing**	**3(2,2)**
Digital photography is now a standard set from compacts to medium format sensor size camera range. Through Adobe Photoshop and Adobe Light Room, this course shall give a wider understanding of digital processing along with important attributes regarding that matter. An image taken from the camera certainly needs modifications to get the best out of it. By that, pictures will look the way we intend them to be, following precise adjustments with an understanding of why and what shall be the result. **Prerequisite**: GRDS 222.		

GRDS 350	**3D Printing & Prototyping**	**3(2,2)**
This course focuses on the fundamental process used in 3D design and model making. It will follow the process industrial designers go through to create 3D printed products. The course will cover the design thinking process to bring initial sketch ideas to life while taking into consideration the limitations at hand. Multiple software applications in the process will be used in designing the 3D models including Adobe Photoshop, Autodesk Maya and Pixalogic Zbrush. **Prerequisite**: GRDS 222.		

GRDS 355	**Calligraphy**	**3(2,2)**
In this course, students will learn the basics of Arabic calligraphy as defined by Ibn Muqla. The variations of the main Arabic scripts are explained through a set of visual examples. The course touches upon Islamic calligraphy as a communicative and embellishing technique used in the visual arts. The practical aspect of the course		

explores the techniques and rules of drawing letters of the main standardized Arabic Script. Calligraphy will also be used to create modern visual expressions. **Prerequisite**: GRDS 305.

GRDS 375	**3D Animation**	**3(3,0)**
In the first section of this course students will learn AutoDesk Maya. They will explore 3D form and space with an emphasis on digital modeling of real-life objects. They will develop and construct 3D objects intended graphically for any design or animation use. The course covers skills from basic to intermediate 3D modeling with an emphasis on texturing and lighting. In the second part of this course Maxwell Realflow, which has become one of the industry standards when it comes to fluid simulation, will be covered. Water simulation and dynamics will be taught and integrated into Maya for rendering. **Prerequisite**: GRDS 423.		

GRDS 380	**VR Illustration & Sculpting**	**3(3,0)**
Virtual Reality is a new technology tool used for game and art production. Its concept has been around for a long time, but only until recently was viewed as a novelty. In this course, students will be able to acquire this new skill for the fast-growing market of design. They will learn illustration in virtual space using the oculus app, TiltBrush, and sculpting on Oculus Medium, which is a replacement of the usual computer softwares, Zbrush or Photoshop. Future possibilities and further advancement in oculus will allow students to even print their models on the 3D printer. **Prerequisite***:* GRDS300		

GRDS 381	**Bookbinding**	**3(2,2)**
This class teaches students various bookbinding techniques: Japanese binding, accordion folding, and signature binding. This course will cover the process of bookbinding from initial concept to the final finished and bound book. Multiple types of bookmaking will be covered along with a detailed explanation of the advantages and disadvantages of each type of binding. Creatively approaching a design problem using book design will be addressed as well as using book design as a form of art.		

GRDS 402	**Silkscreen**	**3(2,2)**
Silkscreen is one of the most flexible and widely used types of printmaking. The class focuses on various silkscreen techniques taught through demonstrations and specific projects. Images and graphic visuals will be made using hand drawn separations, photographic film, digital separations, and photocopied images. Water-based silkscreen inks are used, allowing for soap-and-water cleanup. Students will be encouraged to experiment with multiple techniques and combinations of traditional and contemporary methods. **Prerequisite**: GRDS 300.		

GRDS 403	**Painting**	**3(2,2)**
This course is an introduction to various painting materials, skills, and techniques. It helps students develop an artistic potential to create various moods. Students will learn how to use the brush to create different strokes and how to manipulate color to suit		

their concepts. Color theory will be discussed in class. The course includes detailed studies from still life, landscape, and the human figure. **Prerequisite**: FADR 202.

GRDS 431	**Critical Theory**	**3(3,0)**
This course is an introduction to graphic design theory. It explores the aesthetic and social purposes of design practice through written selections across a century of design evolution. Students will read about design to stimulate growth and change in their own work. Students will also learn how to analyze and critically write essays about design. This course also puts theory into practice where students will be able to manually experiment using past and present theories. **Prerequisites**: GRDS 305; GRDS 310.		

GRDS 436	**Game Design**	**3(2,2)**
Turning ideas into reality, the course game design is a hands-on experience on how to turn concepts, character sketches, storyboard and animations into finalized elements that can be used for the game industry. Students will explore the process of designing meaningful experiences for the players. Working in groups with the computer science students, students will design and develop a 2D/3D game that can be downloaded and tested by the public. **Prerequisites**: GRDS 220		

GRDS 498	**Special Topics in Graphic Design**	**3(3,0)**
A special topic course to be defined based on current and evolving design trends and technological advancements. Students will be able to explore various topics under the vast umbrella of design.		

GRDS 498I	**Special Topics in Graphic Design: Videography in Media**	**3(3,0)**
A fine arts course that will allow students to understand how the world of videography works. It will provide students with an idea of how the world of cinema, video shooting and editing works. Throughout the course students will be expected to complete assignments in shooting, editing and creation of different types of narratives. Students will learn and understand how to shoot and handle different types of videos (documentaries, short film, ads, commercials, social media content creation)		

MINOR IN GRAPHIC DESIGN

Rationale

The CAS-GD department offers a minor in Graphic Design for RHU students. It is designed for students who want to gain basic proficiency in graphic design to enhance and supplement their major program.

Program Objectives

The aims of a minor in Graphic Design are to:

- Provide RHU graduates with a basic proficiency in graphic design
- Support RHU graduates with essential design skills desired/demanded by the market

Learning Outcomes

At the end of this minor, the student is expected to:

- Identify the key elements and principles of design
- Apply design thinking and the design process to create effective visual solutions
- Use the required technical skills learned to develop print and web design solutions
- Experiment with layouts, grids, images, graphical elements, typography and color to communicate an intended message to a target audience

Entrance Requirements

This minor is offered to all RHU students.

Early in their major, interested RHU students need to fill the appropriate form declaring that they will be minoring in Graphic Design while completing their regular major.

Graphic Design Minor Policies

- Obtain a Minor Cumulative Grade Point Average of no less than 70 %
- Overlapped courses between student major requirements and GD minor requirements are counted to fulfill the GD minor requirements.

Career Options

This GD minor allows its holders to seek career opportunities in a variety of sectors (banks, TV channels, advertising companies…) no matter what a student's major is. Graduates from this minor can seek jobs related to branding, advertising, and motion graphics.

Curriculum and Program

The Graphic Design minor consists of six mandatory courses (18 credits) selected to satisfy the requirements of the proposed program objectives and learning outcomes.

III. Mandatory Courses

The six mandatory courses (18 credits) are:

GRDS 203	Introduction to Graphic Design	GRDS 205	3(3,0)
GRDS 205	Type I	GRDS 220	3(3,0)
GRDS 220	Introduction to Digital Media		3(3,0)
GRDS 230	Photography I		3(3,0)
GRDS 310	Design I	GRDS 203	3(2,2)
GRDS 423	Motion Graphics	GRDS 220	3(3,0)

Faculty List

Abdallah, Saber; Instructor, BA in Business Administration, RHU, 2015.

Abou Orm, Lara; Assistant Professor, Ph.D. in Mathematics, Ecole Nationale Supérieure des Mines de Saint Étienne, Saint Étienne 2013.

Al Hajj, Roba; Instructor, Master 2 in Microbial Systems, University of Montpellier, 2011.

Al Sheikh, Mona; Instructor; Diploma in Family Counseling, Future Builders International Academy, 2013.

Baba, Dina; Lecturer, MA, Business Administration, Lebanese American University, 2003.

Banat, Maysaa; Assistant Professor, MA, TESOL, Lebanese University, 1995.

El-Abed, Mohamad; Professor and Chairperson, Ph.D. in Computer Science, University of Caen Lower Normandy France, 2011.

El Zein, Hiam Loutfi: Professor, Ed.D., Educational Management, Leicester University, 2006.

El Ghor; Mohamad; Master in Mathematics, AUB, 2006.

Fares, Najwa; Associate Professor, Ed.D., Educational Research - TESOL, University of Sussex, 2013.

Hajj Chehade, Hana; Ph.D. in Mathematics Analysis, LU, 2013.

Ghader, Rahaf; BA Graphic Design, RHU, 2022.

Halablab, Mahmoud; Professor, Ph.D. in Microbiology, King's College London, University of London, 1991.

Harb, Graziella; Assistant Professor, Ph.D. Applied Linguistics and Literature, USEK, 2018.

Hassoun, Lina; Lecturer, Ph.D. in Art and Arts Sciences, LU, 2020.

Itani, Diala; Instructor, BA in Elementary Education, AUB,2006.

Jouhari, Ibrahim; Instructor, Master of Arts in Political Studies, AUB, 2015

Khodur, Karen;

Nahhas, Kamal; Instructor, MA, Counseling, Walsh University, 1983.

Nasreddine, Elissar; Lecturer, Ph.D. in Mathematics, Toulouse University, Paul Sabatier, 2013.

Nassreddine, Ghalia; Associate Professor, Ph.D. in Technology of Information and Systems, University of Technology of Compiegne 2009.

Rammal, Ali; Assistant Professor, Ph.D. in Computer Science, University of Paul Sabatier, 2010.

Salameh, Talal; Instructor, Master I in Computer Science, Lebanese University, 2007

Salami, Houssam; Associate Professor, Ph.D. in Physics, Lyon 1 University, Claude Bernard, 2007

Sammoura, Noura; Lecturer, Master's in Communication Design, Politecnco de Milano, 2020.

Shamdeen, Fatima; Instructor, MA, TESOL, Lebanese University, 2014.

Srouji, Leen; Lecturer, MA, Secondary Education, University of Kentucky,2010.

Srouji, Serene; Associate Professor and Chairperson, MFA in Design, University of Texas at Austin, 2007

Soloh, Rouaa; Assistant Professor, Ph.D. Computer Science, Normandie University 2022.

Talhouk, Mirna; Instructor, M.Sc., Sociology, Lebanese University, 2001.

Vasilchenko, Larissa; Lecturer, Ph.D. in Education, Kharkov National Pedagogical University, 2007

Wehbe, Mohamad; Ph.D. in Differential and Riemannian Geometry, Claude Bernard University, 2008.

Zebian, Rihab; Instructor, B.S. in Graphic Design, Lebanese American University, 2006.

COLLEGE OF BUSINESS ADMINISTRATION

COLLEGE OF BUSINESS ADMINISTRATION (CBA)

College Officers

Hiam Loutfi Interim President
Hiam Loutfi Acting Vice President for Academic Affairs
Jamil Hammoud Dean

Contact Information
Ms. Suzan Al Ayash
Administrative Assistant
Block G, Room 101-G
Phone: 961 05 603090, Ext. 301
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History and Overview

Being the first and oldest college of the University, The College of Business Administration (CBA) at Rafik Hariri University was established in 1999. Since then, the College has grown significantly and presently offers six undergraduate business programs in Accounting, Business IT Management, Finance and Banking, Human Resources Management, Management, Marketing and Advertising. In addition, the College offers a graduate MBA program in general business administration. Moreover, the CBA takes pride in being the first in Lebanon and the Arab World to offer a graduate MBA program in Oil and Gas Management.

The faculty is active in applied research in several business domains and related areas, with a focus on seeking solutions for actual community problems and issues. To that extent and in partnership with governmental entities, civil society, trade associations and the private sector, the College is actively engaged into ongoing outreach activities and initiatives designed to support community development and prosperity.

In 2019, the CBA became the first Lebanese university to earn full ACBSP accreditation for all of its degrees and programs. This great achievement represents an internationally known and recognized certificate of rigorous and quality education, in accordance with international standards and best practices.

Finally, the CBA distinguishes itself by its systematic COOP Work Experience program which allows its students to gain real world working experiences, and its Community Engagement Experience program which enables the students to develop leadership skills via actual community service.

Vision

The College of Business Administration aims to become a premier innovative institution of business education in the region.

Mission

The College of Business Administration aspires to transform the lives of students through graduate and undergraduate business education, contribute to the advancement of knowledge through applied research, and makes a positive impact on society's pursuit of development and prosperity.

We aim to foster an educational culture and environment of innovation and collaboration which enables the development of leaders and professionals, capable and willing to become agents of principled, ethical, and socially responsible human progress.

The College undertakes its mission in the context of a higher education philosophy that emphasizes proficient technical know-how in a specialization area, reinforced by core knowledge of main business functional areas, and grounded in the general fundamentals of liberal arts education.

Core Values

The College of Business Administration is committed to maintaining a system of norms, behaviors and conduct well-grounded in the following main guiding values:

Academic Freedom of Inquiry
Faculty and students are free to pursue knowledge and learning so long as such pursuits do not breach University and College missions, policies, and regulations.

Excellence through Innovation
The College has an unwavering commitment to the pursuit of excellence in everything we do. Key to this pursuit is our innovative initiatives, ideas, and efforts.

Ethical and Socially Responsible Conduct
The College exercises all efforts possible to ensure the awareness and practice of ethical and socially responsible norms.

Tolerance and Diversity
The College is committed to highlighting and raising awareness of tolerant mentalities which accept and respect differences with others. Moreover, the College recognizes and promotes the enrichment that results from the diversity of individuals, communities, ideas, and perspectives.

Personal Initiative and Individual Responsibility
Leaders and professionals have the courage to initiate and take responsibility for their choices. The College promotes this principle and encourages its stakeholders to learn and act in accordance with it.

Teamwork, collaboration, and cooperation
The College is committed to conducting its affairs in the spirit of teamwork and collaboration. Furthermore, the College opens opportunities for students to learn and appreciate the value of collective work.

Continuous Improvement and Innovation
The College regards continuous improvement and innovation in its programs and scholarship as necessary to meet the challenges of rapidly changing business environments.

College Learning Goals and Objectives

Conforming to the College's mission statement, we aim to transform the lives of our students through graduate and undergraduate business education; the College's Learning Objectives specify the expected resulting outcome of this transformation as graduates capable of becoming agents of human progress.

Accordingly, the general learning objective of the College is to equip its students with the values, knowledge, competencies, and skills needed to produce a positive impact in whatever they do in life. In particular, these values, knowledge, competencies, and skills are as follows:

General and Specialized Knowledge

Knowledge of main business functional areas (CLG1)	Students will acquire basic and fundamental knowledge of main business functional areas, necessary for them to understand the general business environment and its interrelationships.
Specialized knowledge (CLG2)	Students will become proficient in up-to-date theories, applications, best practices, and other dimensions of their chosen area of specialization, including hands-on applications.

Communication

Effective communication (CLG3)	Students will acquire abilities to effectively communicate orally and in writing in various professional environments and settings.

Critical Thinking

Analysis and critical thinking (CLG 4)	Programs and activities in the College will involve learning settings which require students to learn and practice analytical and critical thinking tools and methods.
Ethics and social responsibility (CLG 5)	The college will ensure that its students are exposed to learning opportunities which would allow them to improve their recognition and awareness of ethical dilemmas and socially responsible behaviors.

Ethics and Social Responsibility

Ethical and socially responsible conduct (CLG 6)	The college will ensure that its students are exposed to learning opportunities which would allow them to improve their recognition and awareness of ethical dilemmas and socially responsible behaviors.

Academic Programs

The College of Business Administration offers six undergraduate programs leading to a Bachelor of Business Administration (BBA) degree, two minor programs, and two graduate programs leading to a Master of Business Administration degree (MBA). The programs are as follows:

1. Bachelor of Business Administration in Accounting
2. Bachelor of Business Administration in Business IT Management
3. Bachelor of Business Administration in Finance and Banking
4. Bachelor of Business Administration in Human Resources Management
5. Bachelor of Business Administration in Management
6. Bachelor of Business Administration in Marketing and Advertising
7. Minor in Business Administration
8. Minor in Data Analytics
9. Minor in Human Resources Management
10. Master of Business Administration in General Business Management
11. Master of Business Administration in Oil and Gas Management

Program Codes

The following table lists the code used for each program. This code is used as the prefix of each course designation in the program.

Program Code	Program
BACC	Accounting
BFIN	Finance and Banking
BADM	General Business Administration

BECN	Economics
BITM	Business IT Management
BMGT	Management
BHRM	Human Resources Management
BMKA	Marketing and Advertising

Admission Requirements

Further to fulfilling the University admission requirements, students aspiring to study in one of the business majors may be required to take a placement examination in mathematics, depending on the Lebanese baccalaureate math score. Students who fail to attain a passing score are required to take and pass one or two related courses, depending on their score, to ensure their mastery of basic skills and improve their ability to handle the rigor of college-level subjects. Students are strongly advised to carefully review the University Catalog for admission and degree requirements as well as all related academic policies.

Graduation Requirements

Each Business program grants a Bachelor of Business Administration (BBA) degree which encompasses 99 credits distributed among three categories: University Requirements (UR), College Requirements (CR) and Program Requirements (PR). The University and College requirements are common to all programs in the College of Business Administration. Each department has its own required and elective courses. The credit hour allocations for each program are shown in the following tables:

BBA in Accounting (99 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	-	-	18	12	30	30
College Requirement	6	-	35	-	41	41
Program Requirement	25	3	-	-	28	28
Credits	31	3	53	12	99	100

BBA in Business IT Management (99 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	3	-	15	12	30	30
College Requirement	3	-	38	-	41	41

Program Requirement	25	3	-	-	28	28
Credits	31	3	53	12	99	100

BBA in Finance and Banking (99 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	-	-	18	12	30	30
College Requirement	3	-	38	-	41	41
Program Requirement	25	3	-	-	28	28
Total Credits	28	3	56	12	99	100

BBA in Human Resources Management (99 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	-	-	18	12	30	30
College Requirement	-	-	41	-	41	41
Program Requirement	25	3	-	-	28	28
Total Credits	25	3	59	12	99	100

BBA in Management (99 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	-	-	18	12	30	30
College Requirement	3	-	38	-	41	41
Program Requirement	25	3	-	-	28	28
Total Credits	28	3	56	12	99	100

BBA in Marketing and Advertising (99 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	-	-	18	12	30	30
College Requirement	3	-	38	-	41	41

Program Requirement	25	3	-	-	28	28
Total Credits	28	3	56	12	99	100

A business student in anyone of the programs is eligible for graduation if s/he has:

1) Successfully completed all the requirements of the degree
2) Attained a cumulative GPA of 70% or higher
3) Attained a major GPA of 70% or higher
4) Attained at least a 70% grade in the BADM 490 course
5) Successfully completed the mandatory COOP Work Experience and the Community Engagement Experience.

I. University Requirements (General Education)

Every student is required to take 30 credit hours of general education courses distributed over six domains. Eighteen mandatory credit hours are selected from four domains and twelve elective credit hours selected from three domains as indicated on the following pages.

Domain		Credits	Courses
1	Communication Competency*	9	ENGL 210: English Composition and Rhetoric ENGL 217: Professional English Communication ARAB 212: Arabic Language and Communication CMNS 200: Etiquette
2	Humanities/Fine Arts	3-6	Selected from an approved list
3	Social Sciences/Culture	6	Selected from an approved list
4	Natural Sciences and Technology	6	Natural Sciences One 3-credit course selected from an approved list. Technology BITM 200: Information Technology Essentials
5	Quantitative Reasoning	3	BADM 225: Business Math
6	Community and Sustainability	3	BADM 355: Business Ethics and Social Responsibility

[1] Non-native Speakers of Arabic students are allowed to take either SOCI 310 or CMNS 410 as a substitute for ARAB 212.

Description of the specific courses in this group are given below:

ARAB 212	**Arabic Language and Communication**	**2(2,0)**
This course helps students develop their ability to communicate effectively in standard Arabic. It provides students with the necessary communication skills in Arabic they might need in their future jobs. Specifically, students learn how to write and orally present different forms of workplace documents in Arabic.		

BADM 225	Business Math	3(3,0)
Linear equations, supply and demand analysis, non-linear equations, quadratic functions, exponential and logarithmic functions, compound interests, geometric series, investments appraisal, Derivatives and marginal revenue-cost-profit, elasticity, functions of several variables, partial elasticity and marginal functions, simple optimizations, indefinite and definite integration, matrix operations and Cramer's rule.		

BADM 355	Business Ethics and Social Responsibility	3(3,0)
This course introduces students to the contemporary principles of ethics and social responsibility in business. Students learn to make ethical judgments on important ethical issues they face every day by relating those issues to a framework of ethical principles which includes utilitarianism, justice, moral rights, ethic of care, and vices and virtues. Ethical dilemmas related to conflict of interest, sustainability in business strategy, and corporate governance are examples of issues discussed in this course. Prerequisite: Junior Standing.		

BITM 200	Information Technology Essentials	3(3,0)
This course is an introduction to the general and business use of computers. It covers the basics of hardware, the operating system, the internet, and software with emphasis on MS Office Suite.		

CMNS 200	Etiquette	1(1,0)
This course is designed to help students develop interpersonal and communication skills fundamental for success in the workplace no matter what industry, organization, or sector they are employed in. Students will improve their professional style as they study topics including polite conversation, personal appearance, office politics, diplomacy, telephone, cell phone, and voicemail etiquette, the protocol of meetings, job interview presentation and even international travel. Students will participate in an off-campus formal dining experience. **Co-requisite:** ENGL 210.		

ENGL 210	English Composition and Rhetoric	3(3,0)
This course reviews the fundamentals of good academic writing in English, teaches essay writing essentials and research skills in two rhetorical modes (persuasion and argumentation), and provides practice in writing essays in these modes, research paper, and oral presentation. **Prerequisite:** ENGL 101 or TOEFL 550+ (paper) or 100+ (computer).		

ENGL 217	Professional English Communication	3(3,0)
This is a required course designed to help students develop effective professional communication skills, both orally and in writing. In this course, students learn how to write emails, memos, letters, proposals, reports, and other forms of employment correspondence. In addition, this course helps students sharpen their presentation skills. Broadly, this course enables students to behave professionally and effectively in their prospective jobs. **Prerequisite**: ENGL 210.		

II. College Requirements

A. Remedial Courses

Proficiency in the English Language is a requirement for admission to any program in the College of Business Administration. The student may be required to take a remedial mathematics course, depending on the placement exam or the Baccalaureate score on mathematics. This remedial course does not count toward fulfilling the degree requirements. Description of the remedial course follows.

MATH 189	**Fundamentals of Algebra**	**3(3,0)**
Real number systems, radicals and rational exponents, polynomials, factoring, fractional expressions, lines in the plane, functions and their graphs, inverse functions, solving equation and inequalities, real zeros and the fundamental theorem of Algebra, exponential functions and their graphs, logarithmic functions, and their graphs.		

B. Mandatory Courses

All College of Business Administration students are required to take 41 credit hours of mandatory foundational and business functional courses. Students in the Marketing and Advertising Program take Introduction to Digital Media instead of Quantitative Methods for Business. A list of these courses and their descriptions follows.

Course	Title	Credits	Prerequisite
BACC 205	Financial Accounting	3	
BACC 255	Managerial Accounting	3	BACC 205
BADM 215	Personal Development and Management	1	
BADM 235	Business Research Methodology	1	
BADM 230	Business Law	3	
BADM 250	Business Statistics	3	
BADM 290	Community Engagement Experience	0	
BADM 420[1]	Quantitative Methods for Business	3	BADM 250 or MATH 351
BECN 301	Microeconomics	3	Junior Standing
BECN 302	Macroeconomics	3	Junior Standing
BFIN 300	Financial Management I	3	BACC 205
BITM 300	Business IT Management	3	BITM 200
BITM 350	Fundamentals of Data Analytics	3	BADM 250
BMGT 200	Introduction to Management	3	Co-req. ENGL 210.
BMKA 200	Introduction to Marketing	3	Co-req.: ENGL 210
MATH 207[2]	College Algebra	3	Placement

[1] Students in Marketing and Advertising program take GRDS 220 – Introduction to Digital Media instead of BADM 420- Quantitative Methods for Business

[2] Students who do not pass the Mathematics Placement Test have to take MATH 207. Students who pass the test take a free elective instead of MATH 207.

Descriptions of these courses are given below.

BACC 205	Financial Accounting	3(3,0)
This course is an introduction to the basic concepts and principles of financial accounting. It covers major areas of financial accounting: generally accepted accounting principles, accounting cycle, financial reporting, and the accrual basis of accounting. It provides the necessary understanding of basic accounting principles and procedures for recording the financial assets, inventories, noncurrent assets, liabilities, and owner's equity.		

BACC 255	Managerial Accounting	3(3,0)
This course introduces students to the basic concepts, analyses, uses and procedures of management accounting. It would enable students to understand and view the element of cost as part of activities planned and implemented by a company. It aims to develop managerial decision-making skills by covering the following topics: cost categories, cost-volume-profit analysis, master and flexible budgets, direct costs and manufacturing overhead variances and relevant costs. **Prerequisite**: BACC 205.		

BADM 215	Personal Development and Management	1(1,0)
This course engages the student in a series of self-reflection and self-discovery activities and lectures. It is intended to encourage students to develop themselves and plan for the present and the future by becoming more self-aware. Topics and issues include personality types, communication styles, personal performance factors, career choices, and personal development planning.		

BADM 230	Business Law	3(3,0)
This course introduces the legal framework of business; with emphasis on Lebanese law as it pertains to regulating the conduct of business. Topics include legal concepts, sources of law, types and classes of contracts, legal forms of business organizations, the commercial code and labor issues.		

BADM 235	Business Research Methodology	1(1,0)
This course exposes students to business research methodology and the various steps to systematically solve a business problem or address a market opportunity. The main topics of the course include problem definition, research design and methodology, data collection, and sampling techniques. The course concludes by students writing a research proposal.		

BADM 250	Business Statistics	3(3,0)
Business Statistics introduces students to the fundamentals of applied statistics. Accordingly, students are exposed to the concepts of statistics as they are directly applied in solving business problems. The course will cover random variables, sampling, probability distributions, expectation, hypothesis testing and confidence intervals, analysis of variance, correlation, and simple linear regression.		

BADM 290	Community Engagement Experience	0(0,1)
The Community Engagement experience is a specific number of hours of volunteering by students at community organizations under the supervision of a faculty member. Community organizations may include governmental agencies, non-governmental organizations, and civil society organizations.		

BADM 420	Quantitative Methods for Business	3(3,0)
This course introduces students to managerial decision analysis using quantitative tools. The course will introduce students to the practice of using and building mathematical models that would help managers make informed decisions. Focus is on the applied aspects of statistics and math. As such, the course will cover the basics of probabilistic and statistical techniques, decision analysis, linear programming, optimization, forecasting, and waiting-line theory. **Prerequisite:** BADM 250 or MATH 351.		

BECN 301	Microeconomics	3(3,0)
Students will study the general principles of microeconomics. Included are the theoretical constructs of consumer behavior, cost structure, and the operations of business firms in the market economy under conditions of perfect competition, oligopoly, monopoly, and monopolistic competition. **Prerequisite**: Junior Standing.		

BECN 302	Macroeconomics	3(3,0)
Students will study the general principles of macroeconomics. This course presents the formal Keynesian theory of income determination and its contemporary critiques, including the study of the possible causes and solutions to unemployment and inflation and the importance of the international economy. Government fiscal and monetary policies are examined in detail. **Prerequisite:** Junior Standing.		

BFIN 300	Financial Management I	3(3,0)
This course aims to expose students to the foundational principles, theories, and applications of corporate and business finance as well as financial management. It covers such topics as simple and compound interest, risk and rates of return, time value of money, stocks and bonds valuations, discounted cash flow analysis and financial ratios. **Prerequisite:** BACC 205.		

BITM 300	Business IT Management	3(3,0)
This course provides a comprehensive introduction to information systems and their application. It explains how to use and manage information technologies to revitalize business processes, conduct electronic commerce, improve business decision-making, and gain competitive advantage. **Prerequisite:** BITM 200		

BITM 350	Fundamentals of Data Analytics	3(3,0)
This course introduces students to the statistical techniques used to analyze large datasets. The course covers the theory and application of both parametric and nonparametric methods. Students will learn how to visualize the data using both		

univariate and bivariate plots, how to use factor and cluster analysis in order to investigate whether correlation exists in a multidimensional space, and how to build and test predictive models such as linear regression models, logistic regression models, and time-series models. **Prerequisite:** BADM 250

BMGT 200	**Introduction to Management**	**3(3,0)**
Students study the basic functions of management, and are exposed to modern management practices, current events, problem solving, and ethical dilemmas. Topics include decision making, strategic and operational planning, organizational structure, Human Resources management, leadership, and control techniques. The instructor facilitates discussion and integrates these topics through the use of contemporary business issues and case studies. **Co-requisite**: ENGL 210.		

BMKA 200	**Introduction to Marketing**	**3(3,0)**
This course introduces the basic principles, theories, and practices of marketing in our modern ever-changing business environment. The course covers the marketing process activities on how to create value for customers to capture value from customers in return. It also discusses the marketing mix and how to build long-term customer relationships. Students will analyze case studies about a “real-life” product or service. Videos and in-class discussions on current marketing topics will assist in the learning experience. **Co-requisite**.: ENGL 210		

GRDS 220	**Introduction to Digital Media**	**3(3,0)**
In this course, students will develop a solid foundation of Adobe Illustrator and Adobe Photoshop tools and techniques. Students will learn the difference between vector based and pixel-based programs and how to integrate both work fields to produce creative graphics. Moreover, students will receive a brief introduction about Adobe InDesign: workspace, function and tools.		

MATH 207	**College Algebra**	**3(3,0)**
Solving linear and non-linear equations, modeling with equations, functions, and their graphs, increasing and decreasing functions-transformation, quadratic functions-maxima and minima, modeling with functions, combining functions, polynomial functions and their graphs, dividing polynomials, real zeros of polynomials, complex numbers, complex zeros of polynomials, exponential and logarithmic functions, sequences and summation notation-arithmetic sequences, counting and probability.		

Program Requirements

Requirements for the Bachelor of Business Administration degree are program specific. They encompass two categories: Major and non-major. Each category consists of a set of mandatory courses and a set of elective courses. The program requirements for the Bachelor of Business Administration degree in the different business majors are given hereafter. Details and titles of relevant courses are included in the Student’s Study Plan (SSP) that every business student will have.

Course Coding

Each course offered by the College of Business Administration is designated by a four-letter code representing the college and program followed by a three-digit number denoting the course number, "**Babc xyz**".

The letter **"B"** refers to the College of Business Administration and "**abc**" refers to the program as follows:

ACC: Accounting
ADM: General Business Administration
ECN Economics
FIN: Finance
HRM: Human Resources Management
ITM: Information Technology Management
MGT: Management
MKA: Marketing and Advertising

The three digits number "**xyz**" between **200** and **599** denotes the course's number. The first digit refers to the level of the course and it could be **1** for freshman, **2** for sophomore, **3** for junior, **4** for senior and **5** for graduate.

The following example demonstrates the coding system: BMKA 200 is a sophomore level marketing course in the College of Business Administration.

The designation used to represent credit hours breakdown **c (t, p)** of a course is as follows: **"c"** the total credit hours**, "t"** stands for theoretical component of the course; **"p"** practical or laboratory component. For example, 3(3, 0) represents a 3 credit hour course with three contact lecture hours and zero laboratory hours.

Learning Support Center

The Learning Support Center (LSC) at the College of Business Administration is another manifestation of RHU's resolute commitment to students' academic success. The LSC offers the students a peer-to-peer learning environment that complements classroom learning. The Center aims to support students in advancing their knowledge and skills, reinforcing what they learn in the classrooms or overcoming learning and performance difficulties. In addition to being a focal-point for enquiry and two-way "as questioner-replier" learning, the LSC offers the space for academic interactions that can trigger enhanced learning significantly.

The Center is in room H 101 and is open to all students throughout the week. The LSC is staffed by carefully selected Teaching Assistants who are graduate students and upper-level undergraduate students. Teaching Assistants are always available and ready to assist their fellow students in overcoming their academic challenges. Additionally, an "on-call" faculty member is assigned to ensure that the LSC is performing to the best interest of the students, and to intervene in helping students when necessary.

Center’s resources include books, study guides, course materials, boards, computers, videos, DVD’s, documentaries, and other learning tools.

Financial Studies Department (FSD)

Faculty Members

Chairperson:	Mohamad Tarabay
Professor:	Jamil Hammoud
Assistant Professors:	Mohamad Tarabay, Zeinab Srour
Senior Lecturer:	Rima Hakim
Adjunct Faculty:	Arfan Ayass, Bassel Diab, Mohamad Al Hajj, Maha Hajj Omar

Programs Offered

The Financial Studies Department (FSD) offers three programs – Accounting, Finance and Banking, and Business IT Management. Each program leads to a Bachelor of Business Administration degree. The details of each program follow.

Accounting Program

Program Overview

If you want to be financially literate and able to play a key role in business decision making, then Accounting is the right career choice for you.

Accounting is about the measurement, analysis and communication of financial information pertinent to the economic health of business entities. Accountants devise and use financial information systems to enable investors, creditors, managers and regulators to make sound decisions.

There are two main tracks in accounting: Financial Accounting and Management Accounting. If the purpose is to provide information to investors and creditors for their resource allocation decision making, we are talking about financial accounting. But, if the purpose is to provide information to managers to plan, evaluate performance and make decisions, we are talking about management accounting.

To obtain a Bachelor of Business Administration degree in Accounting, the student must complete a total of 99 credit hours. These hours span University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours is shown in the following table:

BBA in Accounting (99 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	-	-	18	12	30	30
College Requirement	6	-	35	-	41	41
Program Requirement	25	3	-	-	28	28
Total Credits	31	3	53	12	99	100

I. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Business Administration section in this catalog.

II. College Requirements

The list of the College required courses and their description are presented in the introductory pages of the College of Business Administration section in this catalog.

III. Program Requirements

A. Mandatory requirements

The Accounting program's mandatory courses are listed in the table below.

Course #	Title	Credits	Prerequisites
BACC 305	Intermediate Accounting I	3	BACC 205
BACC 310	Cost Accounting	3	BACC 255
BFIN 350	Credit and Financial Analysis	3	BFIN 300
BACC 405	Intermediate Accounting II	3	BACC 305
BACC 450	External Auditing	3	BACC 405
BACC 460	Advanced Financial Accounting	3	BACC 405
BACC 465	Taxation	3	BACC 405
	Major Elective	3	
BADM 485	Co-op Work Experience	1	ENGL 217 Senior Standing
BADM490	Entrepreneurship	3	Senior Standing

B. Major Electives

As part of the program for the Bachelor of Business Administration in Accounting, the student is required to study 3 credit hours of major electives. Major electives could be upper-level courses in accounting or in closely related business areas. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. Meanwhile, they introduce an element of flexibility into the program, which allows the integration of newly emerging topics.

The student should select, in cooperation with the academic advisor, the elective course that best meets his or her needs and aspirations. It is highly recommended that the student register for these courses after completing the Departmental requirements. The table below lists some recommendations for major elective courses:

Course #	Title	Credits	Prerequisites
BACC 350	Accounting Information Systems	3	BACC 205, BITM 300
BACC 455	Internal Auditing	3	BACC 405
BACC 470	Forensic Accounting and Fraud Detection	3	BFIN 300, BACC 205
BADM 480	Independent Studies	3	Advisor's approval

Moreover, under certain conditions, specified by the department and subject to advisor's approval, a student may take BADM 480 (independent studies), as a substitute for a program's mandatory course. The course's description is below.

C. Entrepreneurship

The instructor leads the students through detailed aspects of starting a business, from the identification of the opportunity through the feasibility study, leading up to the preparation of a business plan which covers marketing, operational and financial

aspects. Students also learn about funding, expansion, and franchising strategies. Prerequisite: Senior Standing.

D. Co-op Work Experience

Each student must complete 8 weeks of practical training in an area related to his/her field of interest. The Co-op experience is usually fulfilled during the summer semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on student's progress throughout the Co-op period by conducting field visits and to ensure that student's performance is aligned with his/her aspirations and employer's needs. Students are then required to submit formal reports and posters and make formal presentations about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to require stipulate additional conditions.

Career Opportunities

Accounting offers a wide range of careers in various types of organizations. Besides the traditional roles as financial reporters and analysts, internal and external auditors, cash managers and cost controllers, accountants can act as advisors and strategic input providers to different areas of the organization. Moreover, accountants usually land jobs in all types of government agencies, businesses, industries, and organizations.

Program Goals and Student Learning Outcomes

The purpose of the Accounting Program at the College of Business Administration of Rafik Hariri University is an integrative composite of four main dimensions: General and Specialized Business Knowledge, Communication, Critical Thinking, and Growth Potential.

General & Specialized Business Knowledge

Goal 1	Prepare graduates with an effective level of professional competence in critical accounting tasks and activities.
Outcome 1	Apply essential business knowledge and skills in problem solving and decision making.
Outcome 2	Prepare Financial Statements in accordance with International Financial Reporting Standards, Generally Accepted Accounting Principles, and best practices.

Communication

Goal 2	Equip graduates with knowledge and skills that would facilitate their placement in financial and managerial accounting positions.

Outcome 3	Demonstrate written and oral English communication skills adequate for challenging entry and middle level professional positions and/or in self-employment

Critical thinking

Goal 3	Promote analytical and critical thinking in approaching business issues and problems.
Outcome 4	Identify problematic issues in business, analyse them and present plausible solutions.

Ethics and Social Responsibility

Goal 4	Raise awareness about ethics and social responsibility to promote better business for a better community
Outcome 5	Recognize ethical dilemmas in business and respond to them according to standard codes of conducts, ethics, and best practices.

Study Plan

The Bachelor of Business Administration in Accounting encompasses 99 credit hours that are spread over 6 semesters and two summer sessions. The second summer session should be dedicated to the Community Engagement Experience. Meanwhile, the third session should be for the Co-op work experience. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Fall Semester (16 Credits)			
BACC 205	Financial Accounting	3	
BADM 215	Personal Development and Management	1	
BMGT 200	Introduction to Management	3	Co-req.: ENGL 210.
BITM 200	Information Technology Essentials	3	
ENGL 210	English Composition and Rhetoric	3	Placement
MATH 207	College Algebra*	3	Placement
Year 1, Spring Semester (16 Credits)			
BACC 255	Managerial Accounting	3	BACC 205
BADM 225	Business Math	3	Placement
BADM 235	Business Research Methodology	1	
BADM 250	Business Statistics	3	
BMKA 200	Introduction to Marketing	3	Co-req.: ENGL 210
ENGL 217	Professional English Communication	3	ENGL 210
Year 2, Fall Semester (18 Credits)			
BACC 305	Intermediate Accounting I	3	BACC 205
BACC 310	Cost Accounting	3	BACC 255
BADM 230	Business Law	3	

BECN 301	Microeconomics	3	Junior Standing
BFIN 300	Financial Management I	3	BACC 205
Year 2, Spring Semester (18 Credits)			
BACC 405	Intermediate Accounting II	3	BACC 305
BECN 302	Macroeconomics	3	Junior Standing
BFIN 350	Credit and Financial Analysis	3	BFIN 300
BITM 300	Business IT Management	3	BITM 200
BITM 350	Fundamentals of Data Analytics	3	BADM 250
	Humanities / Fine Arts Elective	3	
Year 2, Summer Semester (0 Credits)			
BADM 290	Community Engagement Experience	0	
Year 3, Fall Semester (15 Credits)			
BACC 450	External Auditing	3	BACC 405
BACC 465	Taxation	3	BACC 405
BADM 355	Business Ethics and Social Responsibility	3	Junior Standing
BADM 420	Quantitative Methods for Business	3	BADM 250 or MATH 351
	Social Science Elective	3	
Year 3, Spring Semester (15 Credits)			
ARAB 212	Arabic Language and Communication	2	
BACC 460	Advanced Financial Accounting	3	BACC 405
BADM 490	Entrepreneurship	2	Senior Standing
CMNS 200	Etiquette	1	Co-req.: ENGL 210
	Major Elective	3	
	Social Science Elective	3	
Year 3, Summer Semester (1 Credit)			
BADM 485	Co-op Work Experience	1	ENGL 217 Senior Standing

* Students exempted from this course based on their score in the mathematics placement exam will select a free elective course as a substitute for it.

Courses Description

I. Mandatory Courses

Descriptions of the major mandatory courses are given below.

BACC 305	**Intermediate Accounting I**	**3(3,0)**
This course is an in- depth study of accounting issues related to the measurement and reporting of assets, liabilities, and income in accordance with IFRS. It enables students to evaluate and understand financial accounting concepts and practices. The course covers: the accounting framework, the use of time value of money in accounting, and the preparation of financial statements. The course also includes a		

detailed study of accounting for current and noncurrent assets. **Prerequisite:** BACC 205.

BACC 310	**Cost Accounting**	**3(3,0)**
This course is a continuation of BACC 255. It offers students a comprehensive knowledge related to cost allocation, process costing and joint and products costing. Moreover, the course deals with the costs of spoilage and waste. It allows students to build a better understanding for quality, time, and cost relationships. The course also concentrates on issues related to capital budgeting and cost control system analysis. **Prerequisite:** BACC 255.		

BACC 405	**Intermediate Accounting II**	**3(3,0)**
This course is a continuation of BACC 305. It concentrates on the measurement and reporting of liabilities and of the various components of stockholders' equity. It introduces students to dilutive securities and their effect on earnings per share. The course emphasizes fair value, proper accounting for financial instruments, and the new developments related to revenue recognition and the reporting of accounting changes and errors. Moreover, the course covers the preparation and presentation of the statement of cash flows in accordance with IFRS. **Prerequisite:** BACC 305.		

BACC 450	**External Auditing**	**3(3,0)**
This course introduces the students to international financial accounting standards and general auditing standards. It will enable the students to develop and apply auditing programs and their procedures to various financial statement items. It concentrates on auditing main business cycles such as the inventory cycle, revenue cycle, expenditure cycle, and investment cycle. **Prerequisite:** BACC 405		

BACC 460	**Advanced Financial Accounting**	**3(3,0)**
This course is designed to allow students to deal with certain specialized financial accounting topics that include consolidated financial statements, accounting practices in forming and liquidating partnerships, accounting for multinational corporations, accounting for branches and segments, and accounting for not-for-profit organizations and governmental accounting. **Prerequisite:** BACC 405.		

BACC 465	**Taxation**	**3(3,0)**
This course covers various aspects of the Lebanese taxation system including methods of tax imposition, taxes on the basis of real profit, computation of taxable profit, tax rates and tax due, taxes on non-residents, fixed assets, holding companies, offshore companies, Insurance companies, financial institutions, tax on employees, tax on movable capital (stocks, interests, dividends, etc.) **Prerequisite:** BACC 405		

BADM 485	**Co-op Work Experience**	**1(0,1)**
The Co-op work experience is designed to provide students with full-time work term in business, industry, or government. The main thrust of this course is the opportunity to put into practice the major aspects of the student's business education. Special		

emphasis will be placed on assessing the attitude and work ethics of the student. Students will be encouraged to network in the industry and to participate in professional organizations. **Prerequisite:** ENGL 217; Senior Standing.

BADM 490	**Entrepreneurship**
The instructor leads the students through detailed aspects of starting a business, from the identification of the opportunity through the feasibility study, leading up to the preparation of a business plan which covers marketing, operational and financial aspects. Students also learn about funding, expansion, and franchising strategies. **Prerequisite:** Senior Standing	

BFIN 350	**Credit and Financial Analysis**	**3(3,0)**
Evaluation of financial fitness and performance is a core activity for credit officers, loan officers and financial managers. That is why this course is designed to equip students with the necessary knowledge and tools to perform sound financial analysis using public and non-public statements and reports. Main areas of analysis include liquidity, profitability, solvency, leverage and market performance. **Prerequisite:** BFIN 300.		

II. Elective Courses

Descriptions of major elective courses are given below.

BACC 350	**Accounting Information Systems**	**3(3,0)**
This course is designed to give students an in-depth understating of the accounting information systems. It introduces the student to file and database organization; business processes and internal controls; the systems development process and the management of information systems. Moreover, end-user application software includes "off the shelf" accounting software packages and spreadsheets. **Prerequisite:** BACC 205, BITM 300.		

BACC 455	**Internal Auditing**	**3(3,0)**
The course develops an understanding and appreciation of the role of internal auditing in an organization. Topics include internal auditing standards, risk assessment, governance, ethics, and audit techniques. **Prerequisite:** BACC 405		

BACC 470	**Forensic Accounting and Fraud Detection**	**3(3,0)**
This course will cover the basic concepts of forensic accounting. Topics include the detection, prevention, investigation, and resolution of various types of fraud. The course covers many types of financial statement fraud, including asset misappropriation, fraudulent financial statements, tax fraud, and electronic fraud. **Prerequisite:** BFIN 300 and BACC 205.		

BADM 480	Independent Studies	3(3,0)
This course focuses on advancing the student's knowledge in his/her area of specialization via research and/or application work done independently, on current or emerging topics, as approved by the assigned faculty member. **Prerequisite:** Advisor's approval.		

III. Non-Business Programs Courses

BACC 210	SME's Financial Planning and Accounting	3(3,0)
This subject provides an overview of today's accounting and financial planning techniques for facility management by professionals who intend to operate their own small business, work as independent contractors, or as freelancers. Using computer software applications, technical professionals should be able to perform, budgeting, materials procurement and management, work order systems, work planning and scheduling, cost control techniques, preparation and understanding of simplified financial statements. At least one-third of coverage in this course is devoted to hands-on practical applications.		

Business IT Management

Program Overview

Success in the workplace in the twenty first century can hardly be achieved without knowledge, skills, and experience in using modern technology and applying its various components, such as information and telecommunication technology (ICT), computer-based systems and business applications.

The Business IT Management program combines business with information technology to enable students to acquire a thorough understanding of how information technology and computer applications improve effectiveness, increase efficiency, and facilitate the conduct of business.

Students are thoroughly exposed to the business uses of database management, programming, networking, telecommunication, electronic commerce, internet, and online development.

To obtain a Bachelor of Business Administration degree in Business IT Management, the student must complete a total of 99 credit hours. These hours span University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours is shown in the following table:

BBA in Business IT Management (99 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	3	-	15	12	30	30
College Requirement	3	-	38	-	41	41
Program Requirement	25	3	-	-	28	28
Total Credits	31	3	53	12	99	100

I. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Business Administration section in this catalog.

II. College Requirements

The list of the College required courses and their descriptions are presented in the introductory pages of the College of Business Administration section in this catalog.

III. Program Requirements

A. Mandatory Requirements

The Business IT Management program mandatory courses are listed in the table below.

Course #	Title	Credits	Prerequisites
BADM 485	Co-op Work Experience	1	ENGL 217; Senior Standing
BADM 415	Digital Transformation in Business	3	Senior Standing
BADM 490	Entrepreneurship	3	Senior Standing
BITM 305	Introduction to Programming	3	BITM 200
BITM 310	Database Management Systems	3	BITM 305
BITM 340	The Development Tools of Information Systems	3	BITM 305
BITM 355	Networking	3	Junior Standing
BITM 401	Web Programming	3	
BMGT 300	Project Management	3	Junior Standing
	Major Elective Course	3	

B. Major Electives

As part of the program for the Bachelor of Business Administration in Business IT Management, the student is required to study 3 credit hours of major electives. Major electives could be upper-level courses in Accounting or in closely related business areas. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. Meanwhile, they introduce an element of flexibility into the program, which allows the integration of newly emerging topics.

The student should select, in cooperation with the academic advisor, the elective course that best meets his or her needs and aspirations. It is highly recommended that the student register for these courses after completing the Departmental requirements. The table below lists some recommendations for major elective courses:

Course #	Title	Credits	Prerequisites
BACC 350	Accounting Information Systems	3	BACC 205, BITM 300
BADM 480	Independent Studies	3	Advisor's approval
BITM 402	Advanced Web Programming	3	BITM 400
BITM 410	Advanced Programming and Data Structures	3	BITM 305
BITM 455	Advanced Networking	3	BITM 355

Moreover, under certain conditions, specified by the department and subject to advisor's approval, a student may take BADM 480 (independent studies), as a substitute for a program's mandatory course. The course's description is below.

C. Entrepreneurship

The instructor leads the students through detailed aspects of starting a business, from the identification of the opportunity through the feasibility study, leading up to the preparation of a business plan which covers marketing, operational and financial aspects. Students also learn about funding, expansion, and franchising strategies. **Prerequisite:** Senior Standing.

D. Co-op Work Experience

Each student must complete 8 weeks of practical training in an area related to his/her field of interest. The Co-op experience is usually fulfilled during the summer semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on student's progress throughout the Co-op period by conducting field visits and to ensure that student's performance is aligned with his/her aspirations and employer's needs. Students are then required to submit formal reports and posters and make formal presentations about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to require stipulate additional conditions.

Career Opportunities

An increasing number of companies and entrepreneurial ventures in the Middle East and North Africa region (MENA) have been trying to capitalize on the computing and information technology revolution to enable and facilitate business operations in areas such as telemarketing, e-trade, e-government, social media, and the like. This is creating numerous job opportunities for people with such skills in such areas as online sales, electronic market research, electronic commerce, online transactions security, phone application development, and information systems management.

Program Goals and Student Learning Outcomes

The purpose of the Business IT Management Program at the College of Business Administration of Rafik Hariri University is an integrative composite of four main dimensions: General and Specialized Business Knowledge, Communication, Critical Thinking, and Growth Potential.

General & Specialized Business Knowledge

Goal 1	Prepare graduates with an effective level of professional competence in conducting critical business activities, particularly those pertaining to Business Information Technology Management.
Outcome 1	Apply essential business knowledge and skills in problem solving and decision making.
Outcome 2	Use ICT tools and programs to enhance performance and improve operational efficiency in business.

Communication

Goal 2	Equip graduates with knowledge and skills that would facilitate their placement in business IT management and systems positions.
Outcome 3	Demonstrate written and oral English communication skills adequate for challenging entry and middle level professional positions and/or in self-employment

Critical thinking

Goal 3	Promote analytical and critical thinking in approaching business issues and problems.
Outcome 4	Identify problematic issues in business, analyse them and present plausible solutions.

Ethics and Social Responsibility

Goal 4	Raise awareness about ethics and social responsibility to promote better business for a better community
Outcome 5	Recognize ethical dilemmas in business and respond to them according to standard codes of conducts, ethics and best practices.

Study Plan

The Bachelor of Business Administration in Business IT Management encompasses 99 credit hours that are spread over 6 semesters and two summer sessions. The second summer session should be dedicated to the Community Engagement Experience. Meanwhile, the third session should be for the Co-op work experience. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Fall Semester (16 Credits)			
BACC 205	Financial Accounting	3	
BADM 215	Personal Development and Management	1	
BITM 200	Information Technology Essentials	3	
BMGT 200	Introduction to Management	3	Co-req.: ENGL 210.
ENGL 210	English Composition and Rhetoric	3	ENGL 101
MATH 207	College Algebra*	3	Placement
Year 1, Spring Semester (16 Credits)			
BACC 255	Financial Accounting	3	BACC 205
BADM 225	Business Math	3	Placement
BADM 235	Business Research Methodology	1	
BADM 250	Business Statistics	3	
BMKA 200	Introduction to Marketing	3	Co-req.: ENGL 210

ENGL 217	Professional English Communication	3	ENGL 210
Year 2, Fall Semester (18 Credits)			
BADM 230	Business Law	3	
BECN 301	Microeconomics	3	Junior Standing
BFIN 300	Financial Management I	3	BACC 205
BITM 305	Introduction to Programming	3	BITM 200
BITM 300	Business IT Management	3	BITM 200
	Science Elective	3	
Year 2, Spring Semester (18 Credits)			
BECN 302	Macroeconomics	3	Junior Standing
BITM 340	Development Tools of Information Systems	3	BITM 305
BITM 310	Database Management Systems	3	BITM 305
BITM 350	Fundamentals of Data Analytics	3	BADM 250
BMGT 300	Project Management	3	Junior Standing
	Humanities / Fine Arts Elective	3	
Year 2, Summer Semester (0 Credits)			
BADM 290	Community Engagement Experience	0	
Year 3, Fall Semester (15 Credits)			
BADM 355	Business Ethics and Social Responsibility	3	Junior Standing
BADM 415	Digital Transformation in Business	3	Senior Standing
BITM 355	Networking	3	Junior Standing
BITM 401	Web Programming	3	
	Social Science Elective	3	
Year 3, Spring Semester (15 Credits)			
ARAB 212	Arabic Language and Communication	2	
BADM 420	Quantitative Methods for Business	3	BADM 250 or MATH 351
BADM 490	Entrepreneurship	3	Senior Standing
CMNS 200	Etiquette	1	Co-req.: ENGL 210
	Major Elective	3	
	Social Science Elective	3	
Year 3, Summer Semester (1 Credit)			
BADM 485	Co-op Work Experience	1	ENGL 217; Senior Standing

* Students exempted from this course based on their score in the mathematics placement exam will select a free elective course as a substitute for it.

Courses Description

I. Mandatory Courses

Descriptions of the major mandatory courses are given below.

BADM 415	Digital Transformation in Business	3(3,0)
This course examines the integration of digital technologies into all areas of business that improves organizational effectiveness, efficiency, and competitiveness. Focusing on rapidly changing business issues, challenges, and opportunities in a digital environment, it blends theory with real-world managerial applications to create, implement and deliver products, processes, services, and experiences that provide customer value. **Prerequisite:** Senior Standing.		

BADM 485	Co-op Work Experience	1(0,1)
The Co-op work experience is designed to provide students with full-time work term in business, industry, or government. The main thrust of this course is the opportunity to put into practice the major aspects of the student's business education. Special emphasis will be placed on assessing the attitude and work ethics of the student. Students will be encouraged to network in the industry and to participate in professional organizations. **Prerequisite:** ENGL 217 ; Senior Standing.		

BADM 490	Entrepreneurship
The instructor leads the students through detailed aspects of starting a business, from the identification of the opportunity through the feasibility study, leading up to the preparation of a business plan which covers marketing, operational and financial aspects. Students also learn about funding, expansion, and franchising strategies. **Prerequisite:** Senior Standing.	

BITM 305	Introduction to Programming	3(2,2)
This is a foundation course for all computer-programming courses. It enhances programming skills and presents the fundamentals of structured programming concepts in C. The course covers primitive data types, expressions, control statements, functions, and arrays. It also provides a hands-on experience on MATLAB. **Prerequisite:** BITM 200; Equivalent to COSC 214.		

BITM 310	Database Management Systems	3(3,1)
Students will explore advanced database concepts, including automation techniques, using popular windows-based DBMS software. The following topics are included in the course: the planning, creation, and maintenance of databases; the development of information retrieval techniques; the design customization of forms; and the creation and use of macros and modules in an automated system. **Prerequisite:** BITM 305; Equivalent to COSC 231, CCEE 315.		

BITM 340	The Development Tools of Information Systems	3(3,0)
This course offers a traditional look at the systems life cycle process. Modeling and charting will be included. The tools and methodology applied by the systems analyst will be studied. The course covers an overview of the system life cycle, UML Diagrams, feasibility analysis, project management, HCI and the golden rules of user interface design. **Prerequisite:** BITM 305, Equivalent to COSC 341, CCEE 510.		

BITM 355	Networking	3(2,2)
An introduction to the field of data communications and networking, covering networking hardware/operating system concepts, modem, WAN, and LAN standards and protocols. **Prerequisite:** Junior Standing; Equivalent to COSC 360, CCEE 354.		

BITM 401	Web Programming	3(3,1)
This course teaches students how to develop and implement web-based programs with emphasis on interface programming. It introduces students to web development and to different client-side languages and styles needed to develop adequate and responsive websites. The course covers HTML5, CSS3, JavaScript/jQuery and responsive design. Equivalent to COSC 333, CCEE 411.		

BMGT 300	Project Management	3(3,0)
This course provides the students with the necessary skills to manage their business projects using effective techniques in leading, organizing, scheduling, and controlling the tasks contributing to the project goals. Topics include selection and statement of work of projects; skills of project managers and task breakdown structure, PERT/CPM scheduling and budgeting. **Prerequisite:** Junior Standing.		

II. Elective Courses

Descriptions of some elective courses are given below.

BACC 350	Accounting Information Systems	3(3,0)
This course is designed to give students an in-depth understating of the accounting information systems. It introduces the student to file and database organization; business processes and internal controls; the systems development process and the management of information systems. Moreover, end-user application software includes “off the shelf” accounting software packages and spreadsheets. **Prerequisite:** BACC 205; BITM 300.		

BADM 480	Independent Studies	3(3,0)
This course focuses on advancing the student’s knowledge in his/her area of specialization via research and/or application work done independently, on current or emerging topics, as approved by the assigned faculty member. **Prerequisite:** Advisor’s approval.		

BITM 402	Advanced Web Programming	3(3,1)
This course focuses on server-side programming. It allows students to get to know how to connect their website or web application to a database, and how to save and retrieve data from that database. The course exposes students to web controls, validation controls, data source controls, data bind controls, state management, as well as working with a third-party medium like XML and web services. **Prerequisite:** BITM 401; Equivalent to COSC 434, CCEE 514.		

BITM 410	Advanced Programming and Data Structures	3(3,1)
This is a continuation course using advanced C++. The student studies object-oriented programming ideas such as classes, objects, polymorphism, data hiding, encapsulation, etc. This course gives the student a new perspective in thinking in objects. **Prerequisite:** BITM 305; Equivalent to COSC 215, CCEE 216.		

BITM 455	Advanced Networking	3(2,2)
This course prepares students to act as a System and Network Administrator by implementing Active Directory Service ADDS in distributed environments that can include complex network services and domain controllers. The covered materials assist students to efficiently automate the administration of users, groups, and computers. **Prerequisite:** BITM 355; Equivalent to COSC 461.		

Finance and Banking Program

Program Overview

The Bachelor of Business Administration with specialization in Finance and Banking is a program carefully designed to prepare graduates for successful careers in financial management, the financial services industry and in banking.

The Program offers a balanced blend of economic and financial theories with general and industry-specific applications carefully designed to ensure an effective level of financial knowledge and competence.

To obtain a Bachelor of Business Administration degree in Finance and Banking, the student must complete a total of 99 credit hours. These hours span University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours is shown in the following table:

BBA in Finance and Banking (99 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	-	-	18	12	30	30
College Requirement	3	-	38	-	41	41
Program Requirement	25	3	-	-	28	28
Total Credits	28	3	56	12	99	100

I. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Business Administration section in this catalog.

II. College Requirements

The list of the College required courses and their descriptions are presented in the introductory pages of the College of Business Administration section in this catalog.

III. Program Requirements

A. Mandatory Requirements

The Finance and Banking program mandatory courses are listed in the table below.

Course #	Title	Credits	Prerequisites
BADM 485	Co-op Work Experience	1	ENGL 217; Senior Standing

BADM 490	Entrepreneurship	3	Senior Standing
BFIN 305	Introduction to Banking	3	Junior Standing
BFIN 310	Financial Markets and Institutions	3	BFIN 300
BFIN 350	Credit and Financial Analysis	3	BFIN 300
BFIN 400	Financial Management II	3	BFIN 300
BFIN 405	Bank Financial and Risk Management	3	BFIN 305
BFIN 450	Investment Analysis	3	BFIN 400
BFIN 455	Financial Derivatives	3	Senior Standing
	Major Elective	3	

B. Major Electives

As part of the program for the Bachelor of Business Administration in Finance and Banking, the student is required to study 3 credit hours of major electives. Major electives could be upper-level courses in Finance, Banking or in closely related business areas. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. Meanwhile, they introduce an element of flexibility into the program, which allows the integration of newly emerging topics.

The student should select, in cooperation with the academic advisor, the elective course that best meets his or her needs and aspirations. It is highly recommended that the student register for these courses after completing the Departmental requirements. The table below lists some recommendations for major elective courses:

Course #	Title	Credits	Prerequisites
BACC 310	Cost Accounting	3	BACC 255
BACC 470	Forensic Accounting and Fraud Detection	3	BFIN 300 and BACC 205
BADM 480	Independent Studies	3	Advisor's approval
BECN 305	Managerial Economics	3	BECN 301
BFIN 355	International Finance	3	BFIN 300, BECN 302

C. Entrepreneurship

The instructor leads the students through detailed aspects of starting a business, from the identification of the opportunity through the feasibility study, leading up to the preparation of a business plan which covers marketing, operational and financial aspects. Students also learn about funding, expansion, and franchising strategies. **Prerequisite:** Senior Standing.

D. Co-op Work Experience

Each student must complete 8 weeks of practical training in an area related to his/her field of interest. The Co-op experience is usually fulfilled during the summer semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on student's progress throughout the Co-op period by conducting field visits and to ensure that student's performance is aligned with his/her aspirations and employer's needs.

Students are then required to submit formal reports and posters and make formal presentations about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to require stipulate additional conditions.

Career Opportunities

The Finance and Banking program equips students with skills and competencies to seek and succeed in a wide range of career opportunities in a variety of organizations and in a number of vibrant industries such as banking, insurance, investments and financial services. Possible career opportunities include financial manager, credit analyst, loan officer, branch manager, trust officer, mortgage banker, financial analyst, investment advisor, and financial planner.

Program Goals and Student Learning Outcomes

The purpose of the Finance and Banking Program at the College of Business Administration of Rafik Hariri University is an integrative composite of four main dimensions: Specialized and General Business Knowledge, Communication, Critical Thinking, and Growth Potential.

General & Specialized Business Knowledge

Goal 1	Prepare graduates with an effective level of professional competence in critical finance and banking tasks and activities.
Outcome 1	Apply essential business knowledge and skills in problem solving and decision making.
Outcome 2	Apply financial theory to evaluate investments and alternatives in terms of performance and risk

Communication

Goal 2	Equip graduates with knowledge and skills that would facilitate their placement in financial and banking positions.
Outcome 3	Demonstrate written and oral English communication skills adequate for challenging entry and middle level professional positions and/or in self-employment

Critical thinking

Goal 3	Promote analytical and critical thinking in approaching business issues and problems.
Outcome 4	Identify problematic issues in business, analyse them and present plausible solutions.

Ethics and Social Responsibility

Goal 4	Raise awareness about ethics and social responsibility to promote better business for a better community
Outcome 5	Recognize ethical dilemmas in business and respond to them according to standard codes of conducts, ethics, and best practices.

Study Plan

The Bachelor of Business Administration in Finance and Banking encompasses 99 credit hours that are spread over 6 semesters and two summer sessions. The second summer session should be dedicated to the Community Engagement Experience. Meanwhile, the third summer session should be for the Co-op work experience. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Fall Semester (16 Credits)			
BACC 205	Financial Accounting	3	
BADM 215	Personal Development and Management	1	
BMGT 200	Introduction to Management	3	Co-req.: ENGL 210.
BITM 200	Information Technology Essentials	3	
ENGL 210	English Composition and Rhetoric	3	Placement
MATH 207	College Algebra*	3	Placement
Year 1, Spring Semester (16 Credits)			
BACC 255	Managerial Accounting	3	BACC 205
BADM 225	Business Math	3	Placement
BADM 235	Business Research Methodology	1	
BADM 250	Business Statistics	3	
BMKA 200	Introduction to Marketing	3	Co-req.: ENGL 210
ENGL 217	Professional English Communication	3	ENGL 210
Year 2, Fall Semester (18 Credits)			
BADM 230	Business Law	3	
BECN 301	Microeconomics	3	Junior Standing
BFIN 300	Financial Management I	3	BACC 205
BFIN 305	Intro to Banking	3	Junior Standing
BITM 300	Business IT Management	3	BITM 200
	Science Elective	3	
Year 2, Spring Semester (18 Credits)			
BECN 302	Macroeconomics	3	Junior Standing
BFIN 310	Financial Markets and Institutions	3	BFIN 300
BFIN 350	Credit and Financial Analysis	3	BFIN 300
BFIN 400	Financial Management II	3	BFIN 300

BITM 350	Fundamentals of Data Analytics	3	BADM 250
	Humanities / Fine Arts Elective	3	
Year 2, Summer Semester (0 Credits)			
BADM 290	Community Engagement Experience	0	
Year 3, Fall Semester (15 Credits)			
BADM 355	Business Ethics and Social Responsibility	3	Junior Standing
BADM 420	Quantitative Methods for Business	3	BADM 250 or MATH 351
BFIN 405	Bank Financial and Risk Management	3	BFIN 305
BFIN 450	Investment Analysis	3	BFIN 400
	Social Science Elective	3	
Year 3, Spring Semester (15 Credits)			
ARAB 212	Arabic Language and Communication	2	
BADM 490	Entrepreneurship	3	Senior Standing
BFIN 455	Financial Derivatives	3	Senior Standing
CMNS 200	Etiquette	1	Co-req.: ENGL 210
	Major Elective	3	
	Social Science Elective	3	
Year 3, Summer Semester (1 Credit)			
BADM 485	Co-op Work Experience	1	ENGL 217; Senior Standing

* Students exempted from this course based on their score in the mathematics placement exam will select a free elective course as a substitute for it.

Courses Description

I. Mandatory Courses

Descriptions of the major mandatory courses are given below.

BADM 485	**Co-op Work Experience**	**1(0,1)**
The first Co-op work experience is designed to provide students with full-time work terms in business, industry, or government. The main thrust of this course is the opportunity to put into practice the major aspects of the student's business education. Special emphasis will be placed on assessing the attitude and work ethics of the student. Students will be encouraged to network in the industry and to participate in professional organizations. **Prerequisite:** ENGL 217; Senior Standing.		

BADM 490	**Entrepreneurship**	**3(3,0)**
The instructor leads the students through detailed aspects of starting a business, from the identification of the opportunity through the feasibility study, leading up to the preparation of a business plan which covers marketing, operational and financial		

aspects. Students also learn about funding, expansion, and franchising strategies. **Prerequisite:** Senior Standing.

BFIN 305	Introduction to Banking	3(3,0)
This course introduces students to the basics of banking and banking operations. Coverage includes such topics as the business of banking, the development of different banking systems, introductory banking regulations, money and interest, credit, product and services, banking risks and performance evaluation. Topics also include the structure and internal organization of banks. **Prerequisite**: Junior Standing.		

BFIN 310	Financial Markets and Institutions	3(3,0)
This course introduces students to the functions and operations of financial systems, markets, institutions, and instruments. It covers loanable funds theory, the term structure of interest rates, money and capital markets, securities markets, banking and other financial services such as insurance, brokerage, and mutual funds. This course also presents the effects and types of financial regulations. **Prerequisite:** BFIN 300.		

BFIN 350	Credit and Financial Analysis	3(3,0)
Evaluation of financial fitness and performance is a core activity for credit officers, loan officers and financial managers. That is why this course is designed to equip students with the necessary knowledge and tools to perform sound financial analysis using public and non-public statements and reports. Main areas of analysis include liquidity, profitability, solvency, leverage, and market performance. **Prerequisite:** BFIN 300.		

BFIN 400	Financial Management II	3(3,0)
As a continuation of Financial Management I, this course exposes students to the financial management of the firm for the purpose of value maximization. That includes capital budgeting, capital structure and leverage, dividend policy, mergers & acquisitions, long term debt and financial planning and policy. **Prerequisite:** BFIN 300.		

BFIN 405	Bank Financial and Risk Management	3(3,0)
This course focuses attention on the principles of bank management of assets and liabilities. Concentration is on the microeconomic problems of financial management of banking firms. Students will learn about the principles of bank balance sheet management and money market operations as well as liquidity ratios and capital adequacy ratios. Moreover, students will also study issues of bank supervision and regulation. **Prerequisite**: BFIN 305.		

BFIN 450	Investment Analysis	3(3,0)
The aim of this course is to introduce students to the principles of portfolio theory and how they apply to investments selection and decisions. Topics include systematic		

portfolio management, portfolio composition, portfolio insurance, portfolio performance, arbitrage, and valuation models. Assets allocation alternatives are covered along with various investment strategies and objectives. **Prerequisite:** BFIN 400.

BFIN 455	**Financial Derivatives**	**3(3,0)**
The aim of this course is for students to develop a good understanding of financial derivatives and their applications to risk management and corporate strategy. The course makes a distinction between using derivatives for hedging risk or speculation. Instruments covered include forwards, futures, options, and swaps. Emphasis is placed on using such instruments in foreign exchange trading in particular. **Prerequisite:** Senior Standing.		

II. Elective Courses

Descriptions of some major elective courses are given below.

BACC 310	**Cost Accounting**	**3(3,0)**
This course introduces students to the basic concepts, analyses, uses and procedures of management accounting. This course would enable students to understand and view the element of cost as part of activities planned and implemented by a company. It covers cost categories, cost behavior, cost-volume-profit analysis, master and flexible budgets, direct costs and manufacturing overhead variances and inventory cost systems. **Prerequisite:** BACC 255.		

BACC 470	**Forensic Accounting and Fraud Detection**	**3(3,0)**
This course will cover the basic concepts of forensic accounting. Topics include the detection, prevention, investigation, and resolution of various types of fraud. The course covers many types of financial statement fraud, including asset misappropriation, fraudulent financial statements, tax fraud, and electronic fraud. **Prerequisite**: BFIN 300 and BACC 205.		

BADM 480	**Independent Studies**	**3(3,0)**
This course focuses on advancing the student's knowledge in his/her area of specialization via research and/or application work done independently, on current or emerging topics, as approved by the assigned faculty member. **Prerequisite:** Advisor's approval.		

BECN 305	**Managerial Economics**	**3(3,0)**
This course is an application of microeconomics theory to a variety of management and planning decisions such as output maximization and cost minimization given the constraints faced by firms. Demand analysis, cost analysis, and different market structures are studied. **Prerequisite:** BECN 301.		

BFIN 355	International Finance	3(3,0)
This course exposes students to international financial management and international trade from the perspective of managers working in international corporations. Topics include the management of foreign exchange exposure, foreign investments, multinational capital budgeting, the balance of payments, determination of exchange rates and international banking. **Prerequisite:** BFIN 300, BECN 302.		

Management and Marketing Studies Department (DMMS)

Faculty Members

Acting Chairperson:	Jamil Hammoud
Assistant Professors:	Mohamad Majzoub, Loubna Saleh
Adjunct Faculty:	Adel Saheb, Buthayna Hajjar, Dorriah Itani, Nassif Al Hakim.

Programs Offered

The Management and Marketing Studies Department (MMD) offers three programs – Management, Human Resources Management, and Marketing and Advertising. Each program leads to a Bachelor of Business Administration degree. The details of each program follow.

Human Resources Management Program

Program Overview

The Human Resources Management program offers students a unique experience into the operational and strategic activities of the HR department, a thought-provoking curriculum flavoured with experiential learning opportunities and taught by internationally certified faculty, and a state-of-the-art platform from which HRM graduates can launch their careers.

To obtain a Bachelor of Business Administration degree in Human Resources Management, the student must complete a total of 99 credit hours. These hours span University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours is shown in the following table:

BBA in Human Resources Management (99 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	-	-	18	12	30	30
College Requirement	-	-	41	-	41	41
Program Requirement	25	3	-	-	28	28
Total Credits	25	3	59	12	99	100

I. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Business Administration section in this catalog.

II. College Requirements

The list of the College required courses and their descriptions are presented in the introductory pages of the College of Business Administration section in this catalog.

III. Program Requirements

A. Mandatory Requirements

The HRM mandatory core courses are listed in the table below.

Course #	Title	Credits	Prerequisites
BADM 485	Co-op Work Experience	1	ENGL 217; Senior Standing
BADM 490	Entrepreneurship	3	Senior Standing

BHRM 300	Human Resources Management	3	BMGT 200
BHRM 305	Labor Law & Relations	3	Junior Standing
BHRM 350	Workforce Planning, Recruitment & Selection	3	BHRM 300
BHRM 400	HR Development & Training	3	BHRM 300
BHRM 450	Performance Management, Compensation & Benefits	3	BHRM 300
BMGT 205	Organizational Behavior	3	BMGT 200
BMGT 485	Strategic Management	3	Senior Standing
	Major Elective	3	

B. Major Electives

As part of the program for the Bachelor of Business Administration in Human Resources Management, the student is required to study 3 credit hours of major electives. Major electives could be upper level courses in their major or a closely related business areas like Project Management, or E-Business. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. Meanwhile, they introduce an element of flexibility into the program, which allows the integration of newly emerging topics.

The student should select, in cooperation with the academic advisor, the elective course that best meets his or her needs, abilities and aspirations. It is highly recommended that the student register for these courses after completing the Departmental requirements. The table below lists some recommendations for major elective courses:

Course #	Title	Credits	Prerequisites
BADM 415	Digital Transformation in Business	3	Senior Standing
BADM 480	Independent Studies	3	Advisor's approval
BFIN 400	Financial Management II	3	BFIN 300
BMGT 300	Project Management	3	Junior Standing
BMKA 450	Event Marketing and Management	3	Senior Standing

Moreover, under certain conditions, specified by the department and subject to advisor's approval, a student may take BADM 480 (independent studies), as a substitute for a program's mandatory course. The course's description is below.

C. Entrepreneurship

The instructor leads the students through detailed aspects of starting a business, from the identification of the opportunity through the feasibility study, leading up to the preparation of a business plan which covers marketing, operational and financial aspects. Students also learn about funding, expansion, and franchising strategies. Prerequisite: Senior Standing.

D. Co-op Experience

Each student must complete 8 weeks of practical training in an area related to his/her field of interest. The Co-op experience is usually fulfilled during the Summer Semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on student's progress throughout the Co-op period by conducting field visits to ensure that student's performance is aligned with his/her aspirations and employer's needs. Students are then required to submit formal reports and posters and make formal presentations about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to require additional conditions.

Career Opportunities

For those who pursue a professional career, business graduates majoring in HRM normally embark on a career path starting as "HR specialist" in one of the functions of HR at a large organization, or as an "HR generalist" in the HR department of a small firm. From there, they can advance to upper level managerial positions. For HRM graduates pursuing an academic career, they can move forward by electing a graduate and postgraduate-studies path in the domain of general management or HRM, leading them to careers in academia and research.

Program Goals and Student Learning Outcomes

The purpose of the Human Resources Management Program at the College of Business Administration of Rafik Hariri University is an integrative composite of four main dimensions: General and Specialized Business Knowledge, Communication, Critical Thinking, and Growth Potential.

General & Specialized Business Knowledge

Goal 1	Prepare graduates with an effective level of professional competence in human resources tasks and activities.
Outcome 1	Apply essential business knowledge and skills in problem solving and decision making.
Outcome 2	Demonstrate knowledge of standard HR functions like recruitment, selection, compensation & benefits, in accordance with legal requirements and professional best practices.

Communication

Goal 2	Equip graduates with knowledge and skills that would facilitate their placement in financial and managerial accounting positions.
Outcome 3	Demonstrate written and oral English communication skills adequate for challenging entry and middle level professional positions and/or in self-employment

Critical thinking

Goal 3	Promote analytical and critical thinking in approaching business issues and problems.
Outcome 4	Identify problematic issues in business, analyse them and present plausible solutions.

Ethics and Social Responsibility

Goal 4	Raise awareness about ethics and social responsibility to promote better business for a better community
Outcome 5	Recognize ethical dilemmas in business and respond to them according to standard codes of conducts, ethics, and best practices.

Study Plan

The Bachelor of Business Administration in Human Resources Management encompasses 99 credit hours that are spread over 6 semesters and two summer sessions. The first summer session should be dedicated to the Community Engagement Experience. Meanwhile, the second session should be for the Co-op work experience. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Fall Semester (16 Credits)			
BACC 205	Financial Accounting	3	
BADM 215	Personal Development and Management	1	
BITM 200	Information Technology Essentials	3	
BMGT 200	Introduction to Management	3	Co-req.: ENGL 210.
ENGL 210	English Composition and Rhetoric	3	Placement
MATH 207	College Algebra*	3	Placement
Year 1, Spring Semester (16 Credits)			
BACC 255	Managerial Accounting	3	BACC 205
BADM 225	Business Math	3	Placement
BADM 235	Business Research Methodology	1	
BADM 250	Business Statistics	3	
BMGT 205	Organizational Behavior	3	BMGT 200
ENGL 217	Professional English Communication	3	ENGL 210
Year 2, Fall Semester (18 Credits)			
BADM 230	Business Law	3	
BECN 301	Microeconomics	3	Junior Standing
BFIN 300	Financial Management I	3	BACC 205
BHRM 300	Human Resources Management	3	BMGT 200
BHRM 305	Labor Law and Labor Relations	3	Junior Standing
BMKA 200	Introduction to Marketing	3	Co-req.: ENGL 210

Year 2, Spring Semester (18 Credits)			
BADM 355	Business Ethics and Social Responsibility	3	Junior Standing
BECN 302	Macroeconomics	3	Junior Standing
BHRM 350	Workforce Planning, Recruitment and Selection	3	BHRM 300
BITM 300	Business IT Management	3	BITM 200
BITM 350	Fundamentals of Data Analytics	3	BADM 250
	Science Elective	3	
Year 2, Summer Semester (0 Credit)			
BADM 290	Community Engagement Experience	0	
Year 3, Fall Semester (15 Credits)			
ARAB 212	Arabic Language and Communication	2	
BADM 420	Quantitative Methods for Business	3	BADM 250 or MATH 351
BHRM 400	HR Training and Development	3	BHRM 300
CMNS 200	Etiquette	1	Co-req.: ENGL 210
	Major Elective	3	
	Social Science Elective	3	
Year 3, Spring Semester (15 Credits)			
BADM 490	Entrepreneurship	3	Senior Standing
BHRM 450	Performance Management, Compensation & Benefits	3	BHRM 300
BMGT 485	Strategic Management	3	Senior Standing
	Humanities / Fine Arts Elective	3	
	Social Science Elective	3	
Year 3, Summer Semester (1 Credit)			
BADM 485	Co-op Work Experience	1	ENGL 217; Senior Standing

* Students exempted from this course based on their score in the mathematics placement exam will select a free elective course as a substitute for it.

Courses Description

I. Mandatory Courses

Descriptions of the major mandatory courses are given below.

BADM 485	**Co-op Work Experience**	**1(0,1)**
The Co-op work experience is designed to provide students with full-time work term in business, industry, or government. The main thrust of this course is the opportunity to put into practice the major aspects of the student's business education. Special emphasis will be placed on assessing the attitude and work ethics of the student. Students will be encouraged to network in the industry and to participate in professional organizations. **Prerequisite:** ENGL 217; Senior Standing.		

BADM 490	Entrepreneurship
The instructor leads the students through detailed aspects of starting a business, from the identification of the opportunity through the feasibility study, leading up to the preparation of a business plan which covers marketing, operational and financial aspects. Students also learn about funding, expansion, and franchising strategies. **Prerequisite:** Senior Standing.	

BHRM 300	Human Resources Management	3(3,0)
This course provides the student with a basic, functional understanding of current Human Resources Management concepts and applications in small and large businesses. Topics include recruitment & selection, training & development, performance management, compensation & benefits, and employee relations and legal compliance. **Prerequisite**: BMGT 200		

BHRM 305	Labor Law & Relations	3(3,0)
This course introduces students to the fundamentals of labor law, collective bargaining, contract administration and social security regulations pertaining to the management of employees. Labor law history, development and applications are aspects of Lebanese labor law covered to the extent they apply to the management of human resources. **Prerequisite:** Junior Standing		

BHRM 350	Workforce Planning, Recruitment & Selection	3(3,0)
The objective of this course is to provide students in the HRM major with a solid basic understanding of the Workforce Planning, recruitment, and selection activities of the HRM function. In particular, this course enables students to perform effective job analysis, write job descriptions, recruit qualified candidates, and utilize modern selection techniques needed to staff the organization with the required human capital. **Prerequisite**: BHRM 300		

BHRM 400	HR Training & Development	3(3,0)
This course will introduce students in the HRM major to the HR Training & Development function of Human Resources Management. It will enable students to design and implement effective and efficient training & development plans to meet the current and future needs of the organization. **Prerequisite**: BHRM 300		

BHRM 450	Performance Management, Compensation & Benefits	3(3,0)
This course will provide students in the HRM major with a solid understanding of the Compensation & Benefits function of Human Resources Management. It will teach students how to establish effective performance management processes and design strategic pay structures and performance-based incentives. This course will also enable students to develop financial and non-financial benefits as part of the total compensation package. Strategic compensation plans for executives, expatriates,		

and the contingent workforce are also covered in this course. **Prerequisite**: BHRM 300.

BMGT 205	Organizational Behavior	3(3,0)
The objective of this course is to allow the student to develop the necessary skills and conceptual tools to understand and deal effectively with human behavior in organizations. Special emphasis will be placed on employee motivation, teamwork, leadership, communication, conflict, and negotiation, in addition to an overview of attitudes, values, personality, and perception. **Prerequisite:** BMGT 200.		

BMGT 485	Strategic Management	3(3,0)
This is an advanced course for upper-level management students. This course covers basic concepts of strategic management, corporate governance and social responsibility, environmental scanning and industry analysis, internal scanning and organizational analysis, and strategy formulation within a global context. **Prerequisite:** Senior Standing.		

II. Elective Courses

Descriptions of major elective courses are given below.

BADM 415	Digital Transformation in Business	3(3,0)
This course examines the integration of digital technologies into all areas of business that improves organizational effectiveness, efficiency, and competitiveness. Focusing on rapidly changing business issues, challenges, and opportunities in a digital environment, it blends theory with real-world managerial applications to create, implement and deliver products, processes, services, and experiences that provide customer value. **Prerequisite:** Senior Standing.		

BADM 480	Independent Studies	3(3,0)
This course focuses on advancing the student's knowledge in his/her area of specialization via research and/or application work done independently, on current or emerging topics, as approved by the assigned faculty member. **Prerequisite:** Advisor's approval.		

BFIN 400	Financial Management II	3(3,0)
As a continuation of Financial Management I, this course exposes students to the financial management of the firm for the purpose of value maximization. That includes capital budgeting, capital structure and leverage, dividend policy, mergers & acquisitions, long term debt and financial planning and policy. **Prerequisite:** BFIN 300.		

BMGT 300	Project Management	3(3,0)
This course provides the students with the necessary skills to manage their business projects using effective techniques in leading, organizing, scheduling, and controlling the tasks contributing to the project goals. Topics include selection and statement of		

work of projects; skills of project managers and task break down structure, PERT/CPM scheduling and budgeting, **Prerequisite:** Junior Standing.

BMKA 450	**Events Marketing and Management**	**3(3,0)**
This course covers the skills and concepts necessary to create, manage, market, and finance special events. It provides a conceptual overview and systematic study of event marketing and management. Additionally, it fosters professionalism, coordination, and collaboration among team members to achieve the objectives of special events. The course concludes by implementing and evaluating a special event. **Prerequisite:** Senior Standing.		

MANAGEMENT PROGRAM

Program Overview

The Management program offers students exceptional preparatory experience into the field of management and administration. Our experienced and dedicated faculty deliver a state-of-the-art curriculum that balances theory and practice, using highly effective pedagogical tools that present students with unlimited opportunities to excel.

To obtain a Bachelor of Business Administration degree in Management, the student must complete a total of 99 credit hours. These hours span University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours is shown in the following table:

BBA in Management (99 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	-	-	18	12	30	30
College Requirement	3	-	38	-	41	41
Program Requirement	25	3	-	-	28	28
Credits	28	3	56	12	99	100

I. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Business Administration section in this catalog.

II. College Requirements

The list of the College required courses and their descriptions are presented in the introductory pages of the College of Business Administration section in this catalog.

III. Program Requirements

A. Mandatory Requirements

The Management mandatory core courses are listed in the table below.

Course #	Title	Credits	Prerequisites
BADM 410	International Business	3	Senior Standing
BADM 485	Co-op Work Experience	1	ENGL 217; Senior Standing
BADM 490	Entrepreneurship	3	Senior Standing

BECN 305	Managerial Economics	3	BECN 301
BHRM 300	Human Resources Management	3	BMGT 200
BMGT 205	Organizational Behavior	3	BMGT 200
BMGT 300	Project Management	3	Junior Standing
BMGT 400	Operations Management	3	BADM 250
BMGT 485	Strategic Management	3	Senior Standing

B. Major Electives

As part of the program for the Bachelor of Business Administration in Management, the student is required to study 3 credit hours of major electives. Major electives could be upper-level courses in Management or in closely related business areas. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. Meanwhile, they introduce an element of flexibility into the program, which allows the integration of newly emerging topics.

The student should select, in cooperation with the academic advisor, the elective course that best meets his or her needs and aspirations. It is highly recommended that the student register for these courses after completing the Departmental requirements. The table below lists some recommendations for major elective courses:

Course #	Title	Credits	Prerequisites
BADM 415	Digital Transformation in Business	3	Senior Standing
BADM 480	Independent Studies	3	Advisor's approval
BFIN 400	Financial Management II	3	BFIN 300
BMGT 410	Quality Management	3	BADM 250
BMKA 365	Sales Management	3	BMKA 200; Junior Standing
BMKA 450	Event Marketing and Management	3	Senior Standing

Moreover, under certain conditions, specified by the department and subject to advisor's approval, a student may take BADM 480 (independent studies), as a substitute for a program's mandatory course. The course's description is below.

C. Entrepreneurship

The instructor leads the students through detailed aspects of starting a business, from the identification of the opportunity through the feasibility study, leading up to the preparation of a business plan which covers marketing, operational and financial aspects. Students also learn about funding, expansion, and franchising strategies. **Prerequisite:** Senior Standing.

D. Co-op Work Experience

Each student must complete 8 weeks of practical training in an area related to his/her field of interest. The Co-op experience is usually fulfilled during the Summer Semester of the second year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on student's progress throughout the Co-op period by conducting field visits to ensure that

student's performance is aligned with his/her aspirations and employer's needs. Students are then required to submit formal reports and posters and make formal presentations about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to require additional conditions.

Career Opportunities

In pursuing a professional career, business management graduates would be highly eligible for entry level administrative positions in industries like banking, insurance, tourism, retail, and in most support functions of the health, education, consultancy, and industrial sectors of the economy. With more experience, they can advance to upper-level managerial positions. For management graduates pursuing an academic career, they can move forward by electing a graduate and postgraduate-studies path in the various specialization paths in the field of management such as HRM, Supply Chain Management, Operations, Retail Management, among others, leading them to careers in academia and research.

Program Goals and Student Learning Outcomes

The objectives of the Management Program at the College of Business Administration of Rafik Hariri University are an integration of four main dimensions: General and Specialized Business Knowledge, Communication, Critical Thinking, and Growth Potential.

The objectives of the Management Program at the College of Business Administration of Rafik Hariri University are an integration of four main dimensions: General and Specialized Business Knowledge, Communication, Critical Thinking, and Growth Potential.

General & Specialized Business Knowledge

Goal 1	Prepare graduates with an effective level of professional competence in conducting critical business tasks, particularly managerial and entrepreneurial activities.
Outcome 1	Apply essential business knowledge and skills in problem solving and decision making.
Outcome 2	Apply managerial and entrepreneurial competency in launching and managing a business.

Communication

Goal 2	Equip graduates with knowledge and skills that would facilitate their placement in financial and managerial accounting positions.
Outcome 3	Demonstrate written and oral English communication skills adequate for challenging entry and middle level professional positions and/or in self-employment

Critical thinking

Goal 3	Promote analytical and critical thinking in approaching business issues and problems.
Outcome 4	Identify problematic issues in business, analyse them and present plausible solutions.

Ethics and Social Responsibility

Goal 4	Raise awareness about ethics and social responsibility to promote better business for a better community
Outcome 5	Recognize ethical dilemmas in business and respond to them according to standard codes of conducts, ethics and best practices.

Study Plan

The Bachelor of Business Administration in Management encompasses 99 credit hours that are spread over 6 semesters and two summer sessions. The second summer session should be dedicated to the Community Engagement Experience. Meanwhile, the second session should be for the Co-op work experience. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Fall Semester (16 Credits)			
BACC 205	Financial Accounting	3	
BADM 215	Personal Development and Management	1	
BITM 200	Information Technology Essentials	3	
BMGT 200	Introduction to Management	3	Co-req.: ENGL 210.
ENGL 210	English Composition and Rhetoric	3	Placement
MATH 207	College Algebra*	3	Placement
Year 1, Spring Semester (16 Credits)			
BACC 255	Managerial Accounting	3	BACC 205
BADM 225	Business Math	3	Placement
BADM 235	Business Research Methodology	1	
BADM 250	Business Statistics	3	
BMGT 205	Organizational Behavior	3	BMGT 200
ENGL 217	Professional English Communication	3	ENGL 210
Year 2, Fall Semester (18 Credits)			
BADM 230	Business Law	3	
BECN 301	Microeconomics	3	Junior Standing
BFIN 300	Financial Management I	3	BACC 205
BHRM 300	Human Resources Management	3	BMGT 200
BMKA 200	Introduction to Marketing	3	Co-req.: ENGL 210
	Science Elective	3	

Year 2, Spring Semester (18 Credits)			
BADM 355	Business Ethics and Social Responsibility	3	Junior Standing
BECN 302	Macroeconomics	3	Junior Standing
BITM 300	Business IT Management	3	BITM 200
BITM 350	Fundamentals of Data Analytics	3	BADM 250
BMGT 300	Project Management	3	Junior Standing
	Humanities / Fine Arts Elective	3	
Year 2, Summer Semester (0 Credits)			
BADM 290	Community Engagement Experience	0	
Year 3, Fall Semester (15 Credits)			
ARAB 212	Arabic Language and Communication	2	
BADM 410	International Business	3	Senior Standing
BADM 420	Quantitative Methods for Business	3	BADM 250 or MATH 351
BMGT 400	Operations Management	3	BADM 250
CMNS 200	Etiquette	1	Co-req.: ENGL 210
	Social Science Elective	3	
Year 3, Spring Semester (15 Credits)			
BADM 490	Entrepreneurship	3	Senior Standing
BECN 305	Managerial Economics	3	BECN 301
BMGT 485	Strategic Management	3	Senior Standing
	Major Elective	3	
	Social Science Elective	3	
Year 3, Summer Semester (1 Credits)			
BADM 485	Co-op Work Experience	1	ENGL 217; Senior Standing

* Students exempted from this course based on their score in the mathematics placement exam will select a free elective course as a substitute for it.

Courses Description

I. Mandatory Courses

Descriptions of the major mandatory courses are given below.

BADM 410	**International Business**	**3(3,0)**
This course is a blend of lectures, case studies, and discussion of current global and international business environments. Students will learn the concepts of international business strategies and procedures, and comparative environmental frameworks. It familiarizes students with theories and practices of international trade, investment, and financial environment. Students will apply strategies of international business, country evaluation and selection, export and import, foreign direct investment, and global marketing. **Prerequisite**: Senior Standing.		

BADM 485	Co-op Work Experience	1(1,0)
The first Co-op work experience is designed to provide students with full-time work terms in business, industry, or government. The main thrust of this course is the opportunity to put into practice the major aspects of the student's business education. Special emphasis will be placed on assessing the attitude and work ethics of the "co-op" student. Students will be encouraged to network in the industry and to participate in professional organizations. **Prerequisite:** ENGL 217 ; Senior Standing.		

BADM 490	Entrepreneurship
The instructor leads the students through detailed aspects of starting a business, from the identification of the opportunity through the feasibility study, leading up to the preparation of a business plan which covers marketing, operational and financial aspects. Students also learn about funding, expansion, and franchising strategies. **Prerequisite:** Senior Standing.	

BECN 305	Managerial Economics	3(3,0)
This course is an application of microeconomics theory to a variety of management and planning decisions such as output maximization and cost minimization given the constraints faced by firms. Demand analysis, cost analysis, and different market structures are studied. **Prerequisite**: BECN 301.		

BHRM 300	Human Resources Management	3(3,0)
This course provides the student with a basic, functional understanding of current Human Resources Management concepts and applications in small and large businesses. Topics include recruitment & selection, training & development, performance management, compensation & benefits, and employee relations and legal compliance. **Prerequisite:** BMGT 200.		

BMGT 205	Organizational Behavior	3(3,0)
The objective of this course is to allow the student to develop the necessary skills and conceptual tools to understand and deal effectively with human behavior in organizations. Special emphasis will be placed on employee motivation, teamwork, leadership, communication, conflict and negotiation, in addition to an overview of attitudes, values, personality, and perception. **Prerequisite:** BMGT 200.		

BMGT 300	Project Management	3(3,0)
This course provides the students with the necessary skills to manage their business projects using effective techniques in leading, organizing, scheduling, and controlling the tasks contributing to the project goals. Topics include selection and statement of work of projects; skills of project managers and task break down structure, PERT/CPM scheduling and budgeting, **Prerequisite:** Junior Standing.		

BMGT 400	Operations Management	3(3,0)
In addition to the principles of supply chain management, students learn advanced skills in forecasting, quality management, facility layout, inventory control systems,		

capacity and aggregate planning, JIT, and statistical process control (SPC). **Prerequisite:** BADM 250.

BMGT 485	**Strategic Management**	**3(3,0)**
This is an advanced course for upper-level management students. It covers basic concepts of strategic management, corporate, environmental scanning and industry analysis, internal scanning and organizational analysis, and strategy formulation, including situation analysis and business strategy, corporate strategy, and functional strategy. **Prerequisite**: Senior Standing.		

II. Elective Courses

Descriptions of some major elective courses are given below.

BADM 415	**Digital Transformation in Business**	**3(3,0)**
This course examines the integration of digital technologies into all areas of business that improves organizational effectiveness, efficiency, and competitiveness. Focusing on rapidly changing business issues, challenges, and opportunities in a digital environment, it blends theory with real-world managerial applications to create, implement and deliver products, processes, services, and experiences that provide customer value. **Prerequisite:** Senior Standing.		

BADM 480	**Independent Studies**	**3(3,0)**
This course focuses on advancing the student's knowledge in his/her area of specialization via research and/or application work done independently, on current or emerging topics, as approved by the assigned faculty member. **Prerequisite:** Advisor's approval.		

BFIN 400	**Financial Management II**	**3(3,0)**
As a continuation of Financial Management I, this course exposes students to the financial management of the firm for the purpose of value maximization. That includes capital budgeting, capital structure and leverage, dividend policy, mergers & acquisitions, long term debt and financial planning and policy. **Prerequisite:** BFIN 300.		

BMGT 410	**Quality Management**	**3(3,0)**
This course highlights the fact that TQM has become a crucial requirement for business excellence in worldwide markets. It offers students the opportunity to learn techniques that establish sustainable quality improvement in both product and services industries. Topics include the 7-quality control tools, SPC, quality function deployment and the house of quality, product reliability, Six Sigma, Benchmarking, quality certification and awards, and quality costing. **Prerequisite:** BADM 250		

BMKA 365	**Sales Management**	**3(3,0)**
Rapidly changing market conditions and customers' expectations are redefining the roles of salespeople and the sales process into a modern framework. This course		

helps students understand and apply practical interpersonal techniques and persuasive communication strategies in the selling process. It focuses on value-added techniques that are based on four broad strategic areas. The concepts of customer value and building and retaining long-term relationships are integrated throughout the course. **Prerequisite**: BMKA 200; Junior Standing.

BMKA 450	**Events Marketing and Management**	**3(3,0)**
This course covers the skills and concepts necessary to create, manage, market, and finance special events. It provides a conceptual overview and systematic study of event marketing and management. Additionally, it fosters professionalism, coordination, and collaboration among team members to achieve the objectives of special events. The course concludes by implementing and evaluating a special event. **Prerequisite:** Senior Standing.		

III. Non-Business Programs Courses

BMGT 210	**SME Management**	**3(3,0)**
A course on how to start and operate a small business. It introduces the fundamentals of business management, including planning, raising capital, using business information, managing employees, and marketing products and services. Participants learn how to start a small business or operate as independent contractors or freelancers. The course includes facts about a small business, essential management skills, and the actual preparation of a business plan, marketing strategies, and legal issues. At least one-third of coverage in this course is devoted to hands-on practical applications.		

MARKETING AND ADVERTISING PROGRAM

Program Overview

The Bachelor of Business Administration with specialization in Marketing and Advertising is a program carefully designed to prepare graduates for successful careers in marketing communications in the media services and advertising industry. These careers require expertise in both marketing and advertising.

The program is founded upon general business and marketing core knowledge base with additional technical and specialized knowledge drawn and integrated together from the main dimensions of marketing, advertising, public relations, and marketing communications.

To obtain a Bachelor of Business Administration degree in Marketing and Advertising, the student must complete a total of 99 credit hours. These hours span University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours is shown in the following table:

BBA in Marketing and Advertising (99 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	-	-	18	12	30	30
College Requirement	3	-	38	-	41	41
Program Requirement	25	3	-	-	28	28
Credits	28	3	56	12	99	100

I. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Business Administration section in this catalog.

II. College Requirements

The list of the College required courses and their descriptions are presented in the introductory pages of the College of Business Administration section in this catalog. Students in Marketing and Advertising take GRDS 220 Introduction to Digital Media instead of BADM 420 Quantitative Methods for Business.

III. Program Requirements

A. Mandatory Requirements

The Marketing and Advertising program mandatory courses are listed in the table below.

Course #	Title	Credits	Prerequisites
BADM 485	Co-op Work Experience	1	ENGL 217; Senior Standing
BADM 490	Entrepreneurship	3	Senior Standing
BMKA 310	Consumer Behavior	3	BMKA 200; Junior Standing
BMKA 365	Sales Management	3	BMKA 200; Junior Standing
BMKA 370	Marketing Research	3	BMKA 200, BADM 250
BMKA 380	Advertising Media and Strategies	3	BMKA 200
BMKA 430	Advertising Design and Creativity	3	GRDS 220, BMKA 350
BMKA 440	Social Media Marketing	3	Senior Standing
BMKA 485	Strategic Marketing	3	Senior Standing
	Major Elective	3	

B. Major Electives

As part of the program for the Bachelor of Business Administration in Marketing and Advertising, the student is required to study 3 credit hours of major electives. Major electives could be upper-level courses in Marketing and Advertising or in closely related business areas. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. Meanwhile, they introduce an element of flexibility into the program, which allows the integration of newly emerging topics.

The student should select, in cooperation with the academic advisor, the elective course that best meets his or her needs and aspirations. It is highly recommended that the student register for these courses after completing the Departmental requirements. The table below lists some recommendations for major elective courses:

Course #	Title	Credits	Prerequisites
BADM 415	Digital Transformation in Business	3	Senior Standing
BADM 480	Independent Studies	3	Advisor's approval
BMGT 300	Project Management	3	Junior standing
BMKA 320	Introduction to Public Relations	3	BMKA 200
BMKA 405	Media Planning Analysis and Management	3	Senior Standing
BMKA 450	Events Marketing and Management	3	Senior Standing

Moreover, under certain conditions, specified by the department and subject to advisor's approval, a student may take BADM 480 (independent studies), as a substitute for a program's mandatory course. The course's description is below.

C. Entrepreneurship

The instructor leads the students through detailed aspects of starting a business, from the identification of the opportunity through the feasibility study, leading up to the

preparation of a business plan which covers marketing, operational and financial aspects. Students also learn about funding, expansion, and franchising strategies. Prerequisite: Senior Standing.

D. Co-op Work Experience

Each student must complete 8 weeks of practical training in an area related to his/her field of interest. The Co-op experience is usually fulfilled during the Summer Semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on student's progress throughout the Co-op period by conducting field visits to ensure that student's performance is aligned with his/her aspirations and employer's needs. Students are then required to submit formal reports and posters and make formal presentations about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to require stipulate additional conditions.

Career Opportunities

The program opens the doors to a range of career possibilities in media, advertising and marketing communications. Career opportunities include such positions as account executive, communications and media planner, advertising and promotion manager, sales manager, brand manager, and marketing manager.

Program Goals and Student Learning Outcomes

The purpose of the Marketing and Advertising Program at the College of Business Administration of Rafik Hariri University is an integrative composite of four main dimensions: General and Specialized Business Knowledge, Communication, Critical Thinking, and Growth Potential.

General & Specialized Business Knowledge

Goal 1	Prepare graduates with an effective level of professional competence in conducting critical business activities, particularly those pertaining to marketing and advertising tasks.
Outcome 1	Apply essential business knowledge and skills in problem solving and decision making.
Outcome 2	Develop integrated marketing communication strategies through advertising designs, promotional approaches, and media plan

Communication

Goal 2	Equip graduates with knowledge and skills that would facilitate their placement in financial and managerial accounting positions.
Outcome 3	Demonstrate written and oral English communication skills adequate for challenging entry and middle level professional positions and/or in self-employment

Critical Thinking

Goal 3	Promote analytical and critical thinking in approaching business issues and problems.
Outcome 4	Identify problematic issues in business, analyse them and present plausible solutions.

Ethics and Social Responsibility

Goal 4	Raise awareness about ethics and social responsibility to promote better business for a better community
Outcome 5	Recognize ethical dilemmas in business and respond to them according to standard codes of conducts, ethics and best practices.

Study Plan

The Bachelor of Business Administration in Marketing and Advertising encompasses 99 credit hours that are spread over 6 semesters and two summer sessions. The first summer session should be dedicated to the Community Engagement Experience. Meanwhile, the second session should be for the Co-op work experience. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Fall Semester (16 Credits)			
BACC 205	Financial Accounting	3	
BADM 215	Personal Development and Management	1	
BITM 200	Information Technology Essentials	3	
BMGT 200	Introduction to Management	3	Co-req.: ENGL 210
ENGL 210	English Composition and Rhetoric	3	Placement
MATH 207	College Algebra*	3	Placement
Year 1, Spring Semester (16 Credits)			
BACC 255	Managerial Accounting	3	BACC 205
BADM 225	Business Math	3	Placement
BADM 235	Business Research Methodology	1	
BADM 250	Business Statistics	3	
BMKA 200	Introduction to Marketing	3	Co-req. ENGL 210
ENGL 217	Professional English Communication	3	ENGL 210
Year 2, Fall Semester (18 Credits)			
BADM 230	Business Law	3	
BECN 301	Microeconomics	3	Junior Standing
BFIN 300	Financial Management I	3	BACC 205
BITM 300	Business IT Management	3	BITM 200
BMKA 310	Consumer Behavior	3	BMKA 200; Junior Standing
	Science Elective	3	

Year 2, Spring Semester (18 Credits)			
BECN 302	Macroeconomics	3	Junior Standing
BITM 350	Fundamentals of Data Analytics	3	BADM 250
BMKA 370	Marketing Research	3	BMKA 200, BADM 250
BMKA 380	Advertising Media and Strategies	3	BMKA 200
GRDS 220	Introduction to Digital Media	3	
	Social Science Elective	3	
Year 2, Summer Semester (0 Credit)			
BADM 290	Community Engagement Experience	0	
Year 3, Fall Semester (15 Credits)			
ARAB 212	Arabic Language and Communication	2	
BMKA 430	Advertising Design and Creativity	3	GRDS 220; BMKA 380
BMKA 440	Social Media Marketing	3	Senior Standing
CMNS 200	Etiquette	1	
	Major Elective	3	
	Humanities / Fine Arts Elective	3	
Year 3, Spring Semester (15 Credits)			
BADM 355	Business Ethics and Social Responsibility	3	Junior Standing
BADM 490	Entrepreneurship	3	Senior Standing
BMKA 365	Sales Management	3	BMKA 200 and Junior Standing
BMKA 485	Strategic Marketing	3	Senior Standing
	Social Science Elective	3	
Year 3, Summer Semester (1 Credit)			
BADM 485	Co-op Work Experience	1	ENGL 217; Senior Standing

* Students exempted from this course based on their score in the mathematics placement exam will select a free elective course as a substitute for it.

Courses Description

I. Mandatory Courses

Descriptions of the major mandatory courses are given below.

BADM 485	**Co-op Work Experience**	**1(1,0)**
The Co-op work experience is designed to provide students with full-time work term in business, industry, or government. The main thrust of this course is the opportunity to put into practice the major aspects of the student's business education. Special emphasis will be placed on assessing the attitude and work ethics of the "co-op" student. Students will be encouraged to network in the industry and to participate in professional organizations. **Prerequisite:** ENGL 217; Senior Standing.		

BADM 490	Entrepreneurship	3(3,0)
The instructor leads the students through detailed aspects of starting a business, from the identification of the opportunity through the feasibility study, leading up to the preparation of a business plan which covers marketing, operational and financial aspects. Students also learn about funding, expansion, and franchising strategies. **Prerequisite:** Senior Standing.		

BMKA 310	Consumer Behavior	3(3,0)
This course introduces students to the world of consumer behavior. Students explore how perceptions, learning, memory, personality, and attitudes influence consumption behavior. They learn how consumption changes during one's life cycle and how powerful cultural and sub-cultural factors influence consumers. Application of theories and case studies analysis are employed throughout the course. **Prerequisites**: BMKA 200; Junior Standing		

BMKA 365	Sales Management	3(3,0)
Rapidly changing market conditions and customers' expectations are redefining the roles of salespeople and the sales process into a modern framework. This course helps students understand and apply practical interpersonal techniques and persuasive communication strategies in the selling process. It focuses on value-added techniques that are based on four broad strategic areas. The concepts of customer value and building and retaining long-term relationships are integrated throughout the course. **Prerequisites**: BMKA 200 and Junior Standing.		

BMKA 370	Marketing Research	3(3,0)
This course introduces students to marketing research and its role in the marketing decision-making planning process. It explains the principles of the marketing research process and helps students apply those principles in real-life marketing problems and/or opportunities. The course will conclude with students submitting a marketing research project in which they identify a marketing problem/opportunity, develop a research methodology, and collect and analyze data using IBM SPSS© Statistics software. Students will learn how to present their research results, make appropriate interpretations and provide recommendations based on their analysis. **Prerequisites**: BMKA 200; BADM 250.		

BMKA 380	Advertising Media and Strategies	3(3,0)
This course introduces students to the role of advertising in the business world from both theoretical and applied perspectives. It outlines the structure of the advertising industry and focuses on the advertising and communication process, message and creative strategy development, and campaign design. The course endorses an integrated marketing communications perspective where students learn strategic media planning, buying, management, and evaluation for advertising purposes. **Prerequisite:** BMKA 200		

BMKA 430	Advertising Design and Creativity	3(3,0)
In this course, students explore and apply principles of graphic design to solve appropriate marketing and advertising problems. The design process is approached from both the creative and business perspective. Students learn to create advertising concepts and ideas and transform them into effective print ads, brochures, and online communication forms. Case studies from broadcast and outdoor media, print ads, and digital marketing channels showcase advertising concepts at work: persuasion, color psychology and composition, copywriting, and typography. **Prerequisites:** GRDS 220; BMKA 380		

BMKA 440	Social Media Marketing	3(3,0)
Social media marketing has become an essential component of modern marketing communications in a dynamic and customer-centric environment. This course is designed to help students master the essential skills of building social media communication strategies, managing different social media channels, and measuring and reporting results. **Prerequisite**: Senior Standing.		

BMKA 485	Strategic Marketing	3(3,0)
This course explores in depth the concepts and methods of the strategic marketing planning process. Drawing heavily from actual marketing case studies, it covers market situational analysis, different marketing strategies and tactics to build and sustain competitive advantage. The course concludes by developing and presenting a marketing plan**. Prerequisite**: Senior Standing.		

II. Elective Courses

Descriptions of some major elective courses are given below.

BADM 415	Digital Transformation in Business	3(3,0)
This course examines the integration of digital technologies into all areas of business that improves organizational effectiveness, efficiency, and competitiveness. Focusing on rapidly changing business issues, challenges, and opportunities in a digital environment, it blends theory with real-world managerial applications to create, implement and deliver products, processes, services, and experiences that provide customer value. **Prerequisite:** Senior Standing.		

BADM 480	Independent Studies	3(3,0)
This course focuses on advancing the student's knowledge in his/her area of specialization via research and/or application work done independently, on current or emerging topics, as approved by the assigned faculty member. **Prerequisite:** Advisor's approval.		

BMGT 300	Project Management	3(3,0)
This course provides the students with the necessary skills to manage their business projects using effective techniques in leading, organizing, scheduling, and controlling the tasks contributing to the project goals. Topics include selection and statement of		

work of projects; skills of project managers and task breakdown structure, PERT/CPM scheduling and budgeting. **Prerequisite:** Junior Standing.

BMKA 320	**Introduction to Public Relations**	**3(3,0)**
This course introduces students to the strategies and tactics of modern public relations practices. It explains the basic concept and theories of public relations by examining campaigns of well-known companies, institutions, and individuals. In addition, the course explains how to plan, develop, and evaluate public relations campaigns using a wide variety of communication tools. **Prerequisite:** BMKA 200.		

BMKA 405	**Media Planning, Analysis, and Management**	**3(3,0)**
This course introduces critical and strategic media planning and evaluation for advertising purposes. The course emphasizes the principles of media planning, buying, and management. Students will study audience measurement, media research, audience segmentation, and advertising strategies. **Prerequisite:** BMKA 380.		

BMKT 450	**Events Marketing and Management**	**3(3,0)**
This course covers the skills and concepts necessary to create, manage, market, and finance special events. It provides a conceptual overview and systematic study of event marketing and management. Additionally, it fosters professionalism, coordination, and collaboration among team members to achieve the objectives of special events. The course concludes by implementing and evaluating a special event. **Prerequisite:** Senior Standing.		

MINOR IN BUSINESS ADMINISTRATION PROGRAM

Program Overview

In today's world of globalization, interdependence and tough competitive pressures, professional work environments have become multidimensional and multidisciplinary, regardless of one's area of expertise. Consequently, 21st century's professionals are expected to branch out of their areas of expertise and acquire additional competencies, which would enable them to meet the challenges of diverse tasks and work assignments. In particular, it has become difficult today to succeed in engineering, science, medicine, the arts and humanities without some fundamental competence in business administration.

In recognition of this particular development, and in an effort to meet its demands and expectations, the College of Business Administration at Rafik Hariri University offers a Minor in Business Administration program to non-business students. The program is designed to ensure acquisition of a fundamental base of knowledge and competence in business administration, with a flavor of entrepreneurship.

Program Requirements

To successfully complete the Minor in Business Administration program, a student must

1) Declare a Minor in Business Administration by completing the Minor Declaration Form;
2) Obtain the approval of the dean of the college major and the dean of the College of Business Administration.
3) Obtain a Minor Cumulative Grade Point Average of no less than 70 %.
4) Complete 18 credits of business coursework as specified below

Course #	Title	Credits	Prerequisites
BACC 205	Financial Accounting	3	
BADM 490	Entrepreneurship	3	Senior Standing
BECN 301 or BECN 302	Microeconomics or Macroeconomics	3	Junior Standing
BFIN 301	Financial Management I	3	BACC 205
BMGT 200	Introduction to Management	3	Co-req.: ENGL 210
BMKA 200	Introduction to Marketing	3	Co-requisite ENGL 210
* Engineering students may take Engineering Economics instead of Microeconomics or Macroeconomics, and Engineering Project Management instead of Introduction to Management. Computer Science students may take Project Management instead of Entrepreneurship.			

Learning Goal

Provide students with a fundamental base of knowledge and competence in business administration, with a flavor of entrepreneurship.

Learning Objectives

Upon Completion of the minor program, students should be able to

1) Identify and explain basic core concepts in main business functional areas, namely accounting, economics, finance, management, and marketing.
2) Utilize business principles to assess and consequently understand the dynamics of internal and external business environments.
3) Assess and discuss the requirements needed to launch and succeed in a startup business and entrepreneurial initiatives.

MINOR IN HUMAN RESOURCES MANAGEMENT

Program Overview

This Minor program aims to prepare students for professional certification and/or a career in human resources management. Although it is designed to expand and broaden the professional credentials of non-business students, the latter may still find value added to the program.

Students in humanities, social science and languages may greatly benefit from the program by adding a practical business dimension to their capacity for career choice and employment.

Program Requirements

To successfully complete the Minor in Human Resources Management program, a student must

1) Declare a Minor in Human Resources Management by completing the Minor Declaration Form.
2) Obtain the approval of the dean of the college major and the dean of the College of Business Administration.
3) Obtain a Minor Cumulative Grade Point Average of no less than 70 %.
4) Complete 18 credits of business coursework as specified below

Course #	Title	Credits	Prerequisites
BHRM 300	Human Resources Management	3	BMGT 200
BHRM 305	Labor Law and Labor Relations	3	Junior Standing
BHRM 350	Workforce Planning, Recruitment and Selection	3	BHRM 300
BHRM 400	HR Training and Development	3	BHRM 300
BHRM 450	Performance Management, Compensation and Benefits	3	BHRM 300
BMGT 200	Introduction to Management	3	Co-req. ENGL 210

It should be noted that common courses between student major requirements and BHRM minor requirements are counted to fulfill the minor requirements. Nonetheless, the student must complete a minimum of 6 credit hours of coursework that are not counted toward the requirement for his/her major or any other minor.

Students majoring in Management already take BMGT 200 and BHRM 300. They may also benefit from taking one of the other courses listed above as a major elective. Accordingly, they will still need to complete 3 courses or 9 credits to obtain the minor.

Students majoring in business, other than BHRM or BMGT, already take BMGT 200. They may also benefit from taking one of the other courses listed above as a major elective. Accordingly, they will still need to complete 4 courses or 12 credits to obtain the minor.

Learning Goal

The primary goals of this minor program are to:

a. Familiarize students with the theories, principles, and best practices of human resources management.
b. Enable students to leverage their knowledge in other domains into the best practices of employee relations.
c. Provide students with the theoretical and educational background needed for certification and/or employment in human resources

Learning Objectives

Upon completion of this minor, students will be able to:

1. Demonstrate key knowledge and skills in human resources management,
2. Apply analytical skills to HR problem-solving,
3. Contribute to individual, team and organizational goals using interpersonal communication skills,
4. Reflect upon the basics of organizational and human resources strategic planning

Faculty List

Al Hakim Nassif; Instructor, Master of Business Law, LAU,2018.

Al Majzoub, Mohamad; Assistant Professor, Ph.D. in Business Management, VGTU, 2023.

Ayass, Arfan; Instructor, MS in Accounting, University of South Carolina, USA, 1969.

Diab, Basel; Lecturer, Ph.D. in Economics- Economic Informatics, The Bucharest University of Economic Studies, Romania, 2021.

El Hajj, Mohamad; Lecturer, Ph.D. in Management & Economic Sciences, Universite de Poitiers, 2015.

Hajj Omar, Maha; Lecturer, DBA, Paris School of Business, 2023.

Hajjar, Buthayna; Instructor, MBA, Lebanese American University, 2011

Hakim, Rima; Senior Lecturer, M.S., CMA in Business Management, Beirut University College (BUC), Beirut, Lebanon, 1993.

Hammoud, Jamil; Professor and Dean, Ph.D. in Economics, Ecole des Hautes Etudes en Sciences Sociales (EHESS), Paris, France, 2003.

Itani, Doriah; Instructor, PHR, MBA, Rafik Hariri University, Lebanon, 2011.

Saheb, Adel; Instructor, MS in Construction Management, University of Pittsburg, USA, 1987.

Saleh, Loubna; Lecturer, MBA, Lebanese American University, 2011.

Srour, Zeinab; Assistant Professor, Ph.D. in Management (Finance) & Applied Mathematics, University of Rennes 1 & LU, 2019.

Tarabay Mohamad, Associate Professor and Chair, DBA in Finance, Grenoble Ecole De Management, Grenoble, France, 2010.

Wahbi, Marwan; Lecturer, DBA in Marketing, Grenoble Ecole De Management, Grenoble, France, 2017.

COLLEGE OF ENGINEERING

COLLEGE OF ENGINEERING (CE)

College Officers

Hiam Loutfi	Interim President
Hiam Loutfi	Acting Vice President for Academic Affairs
Toufic Hijazi	Dean

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History

The College of Engineering at Rafik Hariri University (RHU) was established in 1999. Since then, the College has grown significantly and presently offers six undergraduate engineering programs in Biomedical, Civil, Computer and Communications, Electrical, Mechanical, and Mechatronics Engineering. Fully accredited by the Lebanese Ministry of higher education, the College is working with each department and program towards accreditation by the Engineering Accreditation Commission of ABET – the most prestigious accrediting agency worldwide.

The College also features active research programs in several engineering areas. In this regard, master's degree programs in all six programs are available. For those students who are employed and can only be present on campus in the afternoons, a non-thesis master's degree option is also available. More than 400 students are currently enrolled in undergraduate and graduate programs.

Overview

The College of Engineering at RHU was established to fill a perceived gap that existed in high caliber, yet affordable, higher education in technology and associated fields. The College strives to apply learning methodologies that can transform entrant students into 21st century leaders in their respective fields. Furthermore, the College stresses the important balance between knowledge-skills and application. To the latter's effect, specialized Labs, modern classrooms, and a unique Co-op experience are implemented.

Vision

The College of Engineering aspires to be a center of excellence in engineering education and an incubational environment for innovation that serves Lebanon, the region and worldwide.

Mission

The College of Engineering's mission is to provide quality professional education in a learning environment conducive to transformation that will enable our students to effectively innovate practical solutions to society's problems and individual needs in Lebanon, the Middle East, and the world.

Goals

We strive to achieve our mission. To this end, we are committed to ever-revise our programs while keeping our senses tuned to our surroundings. More than anything else, our students - their learning and potential success - receive our greatest attention.

Values

The college of Engineering fully endorses the values of RHU of: Academic Freedom of Inquiry, Excellence through Innovation, Ethical and Socially Responsible conduct, Tolerance and Diversity, Personal Initiatives and Individual Responsibility, Teamwork, Collaboration and cooperation, and Continuous Improvement.

Accreditation

The Bachelor of Engineering programs in Biomedical Engineering, Civil Engineering, Computer and Communications Engineering, Electrical Engineering, Mechanical Engineering, and Mechatronics Engineering have been accredited by the Engineering Accreditation Commission (EAC) of ABET, 415 North Charles Street, Baltimore, MD 21201; www.abet.org.

ABET is the most prestigious and internationally renowned engineering accreditation organization in the USA. ABET accreditation verifies that our educational experience meets the global standard for technical education in engineering profession and enhances employment opportunities—multinational engineering corporations require graduation from an ABET accredited program.

Academic Programs

The College of Engineering offers six undergraduate programs leading to a Bachelor of Science (BS) or a Bachelor of Engineering (BE) degree, and six programs leading to a Master of Science Degree (MS).

Bachelor of Science Programs

1. Bachelor of Science in Civil Engineering
2. Bachelor of Science in Electrical Engineering
3. Bachelor of Science in Computer and Communications Engineering
4. Bachelor of Science in Biomedical Engineering
5. Bachelor of Science in Mechanical Engineering
6. Bachelor of Science in Mechatronics Engineering

Bachelor of Engineering Programs

1. Bachelor of Engineering in Civil Engineering
2. Bachelor of Engineering in Electrical Engineering
3. Bachelor of Engineering in Computer and Communications Engineering
4. Bachelor of Engineering in Biomedical Engineering
5. Bachelor of Engineering in Mechanical Engineering
6. Bachelor of Engineering in Mechatronics Engineering

Master of Science Programs

1. Master of Science in Civil Engineering
2. Master of Science in Electrical Engineering
3. Master of Science in Computer and Communications Engineering
4. Master of Science in Biomedical Engineering
5. Master of Science in Mechanical Engineering
6. Master of Science in Mechatronics Engineering

Program Codes

The following table lists the code used for each program. This code is used as the prefix of each course designation in the program.

Program Code	Program
CIVE	Civil Engineering
BIOM	Biomedical Engineering
CCEE	Computer and Communications Engineering
ELEC	Electrical and Electronics Engineering
MECH	Mechanical Engineering
MECA	Mechatronics Engineering

Admission Requirements

Further to fulfilling the University admission requirements, students aspiring to study in one of the engineering majors but did not submit SAT I scores may be required to take a placement examination in mathematics and physics, depending on the Lebanese Baccalaureate score on those subjects. Students who fail to attain a passing score in one of these subjects are required to take and pass a related remedial course to ensure their mastery of basic skills and improve their ability to handle the rigor of college-level subjects. Students are strongly advised to carefully review the University Catalog for admission and degree requirements as well as all related academic policies.

Graduation Requirements

Each Engineering program grants students one of two undergraduate degrees, either a Bachelor of Science (BS) or a Bachelor of Engineering (BE). The BS program encompasses 114 credits and the BE 147 credits. A student must choose the degree that s/he wishes to attain before completing 60 credits. The first three years are common in both programs (except for BS project). A student is eligible to receive a BS degree after completing the 114 credits cited in the first three years of the program's study plan. In addition to completing the credits requirements a student is eligible to earn the BS or BE degree if s/he attains a Cumulative GPA, a Major GPA, and a Summative Learning Project Grade of 70 or above.

Students who completed and earned their BS degree from RHU and wish to pursue BE degree in the same major, may re-apply for admission to the BE program. However, the student needs to take a technical elective course (3 credits) to replace the BS project.

The required credits are distributed among three categories: University requirements (UR) General Education (GE), College requirements (CR) and program requirements (PR). The University General Education and College requirements are common to all departments in the College of Engineering. Each department has its own required mandatory and elective courses. The credit hour allocations for each degree (BS or BE) in each program are shown in the following table.

Bachelor of Engineering (BE) degrees - 147 credits							
Program	General Education		College Requirements		Program Requirements		Total Credits
	Mandatory	Electives	Mandatory	Electives	Mandatory	Electives	
CIVE	21	9	29	0	73	15	147
BIOM	21	9	26	3	73	15	147
CCEE	21	9	29	0	73	15	147
ELEC	21	9	26	3	73	15	147
MECH	21	9	26	3	73	15	147
MECA	21	9	26	3	73	15	147
Credits	30		29		88		
Bachelor of Science (BS) degrees - 114 credits							

Program	General Education		College Requirements		Program Requirements		Total Credits
	Mandatory	Electives	Mandatory	Electives	Mandatory	Electives	
CIVE	21	6	26	0	61	0	114
BIOM	21	6	23	3	61	0	114
CCE	21	6	26	0	61	0	114
ELEC	21	6	23	3	61	0	114
MECH	21	6	23	3	61	0	114
MECA	21	6	23	3	61	0	114
Credits	27		26		61		114

An engineering student in all programs is eligible for graduation if s/he has:

1. Completed all the requirements of the degree
2. Attained a cumulative GPA of 70 or above.
3. Attained a major GPA of 70 or above.
4. Attained a grade of 70 or above on the Summative Learning Project.
5. Received a passing grade on the Co-op work experience.

I. General Education

Every BE (BS) bound student is required to take 31 credits (28 credits) of general education courses distributed over seven domains. 22 mandatory credit hours are taken from Domains 1, 4, 5, and 6 in addition to 9 (6 for B bound students) elective credit hours from domains 2 and 3 as indicated below.

Domain		Credits	Courses
1	Communication Competency*	9	ENGL 210: English Composition and Rhetoric ENGL 217: Professional English Communication ARAB 212: Arabic Language and Communication CMNS 200: Etiquette
2	Humanities/Fine Arts	3	Selected from an approved list
3	Social Sciences/Culture	6	Selected from an approved list
4	Natural Sciences and Technology	6	3 Credits – All programs CCEE 214 or COSC 214 – Introduction to Programming 3 Credits Science Course: CHEM211-Environ.Chemistry-for CIVE+MECH+MECA and PHYS 312 – Modern Physics for CCEE+ELEC+BIOM

5	Quantitative Reasoning	3	MATH 351 - Probability and Statistics ENGR 300 – Engineering Economics and Management

Description of the specific courses in this group are given below.

ARAB 212	**Arabic Language and Communication**	**2(2,0)**
This course helps students develop their ability to communicate effectively in standard Arabic. It provides students with the necessary communication skills in Arabic they might need in their future jobs. Specifically, students learn how to write and orally present different forms of workplace documents in Arabic.		

CCEE 214	**Introduction to Programming + Lab**	**3(2,1)**
Understanding of the basic principles of programming and computer systems; Applications of programming to the solution of engineering problems; Control structures, functions, arrays, pointers and structures. Laboratory experiments of programming for concepts. Equivalent to COSC 214.		

CMNS 200	**Etiquette**	**1(1,0)**
This course is designed to help students develop interpersonal and communication skills fundamental for success in the workplace no matter what industry, organization, or sector they are employed in. Students will improve their professional style as they study topics including polite conversation, personal appearance, office politics, diplomacy, telephone, cell phone, and voicemail etiquette, the protocol of meetings, job interview presentation and even international travel. Students will participate in an off-campus formal dining experience. **Co-requisite:** ENGL 210.		

ENGL 210	**English Composition and Rhetoric**	**3(3,0)**
This course reviews the fundamentals of good academic writing in English, teaches essay writing essentials and research skills in two rhetorical modes (persuasion and argumentation), and provides practice in writing essays in these modes, research paper, and oral presentation. **Prerequisite:** ENGL 101 or TOEFL 550+ (paper) or 80+ (computer).		

ENGL 217	**Professional English Communication**	**3(3,0)**
This is a required course designed to help students develop effective professional communication skills, both orally and in writing. In this course, students learn how to write emails, memos, letters, proposals, reports, and other forms of employment correspondence. In addition, this course helps students sharpen their presentation skills. Broadly, this course enables students to behave professionally and effectively in their prospective jobs. **Prerequisite**: ENGL 210.		

ENGR 300	**Engineering Economics and Management**	**3(3,0)**
Concepts and techniques in basic Engineering economy principles and applications. Interest and financial mathematics; present worth, annual worth, benefit/cost ratio, internal rate of return, multiple alternatives, income tax, inflation, Risk analysis,		

Investment and investment choice, equivalence, loans, cost of capital, retirement and replacement, sector analysis and viewpoint, sensitivity analysis, accounting, and financial statements.

MATH 351	**Probability and Statistics**	**3(3,0)**
Probability and conditional probability, Discrete and continuous random variables, marginal distributions, expectation, variance-mean-median-covariance and correlation, conditional expectation, binomial, multinomial and Poisson distributions, Normal distribution, Sampling distribution, Prediction and confidence intervals, Hypothesis testing. **Prerequisite**: MATH 211.		

II. College Requirements

A. Remedial Programs and Courses

Proficiency in the English Language is a requirement for admission to any program in the College of Engineering. In addition, all incoming engineering students must sit in for the placement exams in mathematics and physics. Depending on the scores on the placement exam, a student may be required to take one or two remedial course(s) in Physics and/or Mathematics prior to taking program level calculus and physics courses. The possible remedial courses are:

- MATH 190 - Calculus I
- MATH 191 – Calculus II
- PHYS 190 - General Physics – Mechanics (for MECH/MECA/CIVE students)
- PHYS 191 - General Physics - Electricity and Magnetism (for ELEC/CCE/BIOM students)

These remedial courses do not count toward fulfilling the degree requirements. Description of the remedial courses follows.

MATH 190	**Calculus I**	**3(3,0)**
Functions and their graphs, limits and continuity, differentiation, applications of derivatives, Extreme values and mean value theorem, definite and indefinite integrals, the substitution method.		

MATH 191	**Calculus II**	**3(3,0)**
Inverse trigonometric functions, integration techniques, parameterizations and parametric curves, vectors and dot and cross products, Lines and planes in space, curves in space, curvature, and normal vectors of a curve. **Prerequisite**: Math 190.		

PHYS 190	**General Physics – Mechanics**	**3(3,0)**
This course introduces students to the basic concepts and principles of Mechanics: Vectors, displacement, velocity, and acceleration; motion in 1D, projectile motion, forces, and Newton's laws of motion; work, energy, momentum, collision, torque, and rotational motion.		

PHYS 191	General Physics - Electricity and Magnetism	3(3,0)
This course is an introduction to electricity and magnetism. In this course, students will explore electric charges, electric forces and electric fields, electrical energy and potential, capacitance, direct-current circuits, magnetic force, magnetic field, induced voltage and inductance, alternating-current circuits, and electromagnetic waves.		

B. Mandatory Courses

All Engineering students (BS and BE) are required to take 25 credit hours of college required courses. The BE program includes an additional mandatory 3-credit course Engineering Project Management. A list of these courses and their descriptions follows.

Course	Title	Credits	Notes
Mathematics (16 credits for MECH, MECA, and CCEE; 13 Credits for others)			
MATH 210	Discrete Mathematics	3	CCE major only
MATH 211	Calculus III	4	All majors
MATH 311	Linear Algebra and Applications	3	All majors
MATH 314	Ordinary Differential equations	3	All majors
MATH 317	Partial Differential Equations	3	MECH & MECA majors only
MATH 421	Numerical Analysis	3	All majors
Sciences (6 credits for MECH, MECA, and CCEE; 9 Credits for all others)			
BIOL 210	Human Anatomy and Physiology and Lab	3	BIOM major only
CHEM 210	Principles of Chemistry	3	CIVE major only
GEOL 221	Fundamentals of Geology	3	CIVE major only
PHYS 210	Fundamentals of Physics and Lab	3	MECH, MECA and CIVE majors only
PHYS 211	Physics: Electricity and Magnetism and Lab	3	ELEC, CCE and BIOM majors only
	Science Elective	3	MECH, MECA, ELEC, CCE and BIOM majors only
	Science Elective	3	ELEC major
Engineering (6 Credits)			
ELEC 210	Electric Circuits	3	All majors
ENGR 510	Engineering Project Management	3	All majors (BE track only)

Descriptions of the required Engineering, mathematics and science courses are given below.

C. Engineering Courses

Descriptions of Engineering required courses are given below.

ELEC 210	Electric Circuits	3(3,0)
Circuit elements and laws, mesh and node equations, network theorems, energy storage elements, RC, RL, and RLC circuits, Laplace Transform, sinusoids and phasors and introduction to network theory. Sinusoidal (AC) steady state, mutual		

inductance, transformers, and introduction to three phase circuit. **Prerequisite**: PHYS 191 or Equivalent.

ENGR 510	**Engineering Project Management**	**3(3,0)**
The course covers key components of engineering project management including projects election and planning, project time management, cost estimation and pricing, contract and specifications, quality management, engineering ethics and professional conduct, realizing impact of engineering solutions in various contexts (global, economic, environmental, societal, etc...), sustainability in engineering designs, human resources consideration, communications, risk management, and procurement management. **Prerequisite:** ENGR 300.		

D. Mathematics

Description of required mathematics courses are given below.

MATH 210	**Discrete Mathematics**	**3(3,0)**
Logic, propositional equivalences, predicates and quantifiers, methods of proof, proof strategy, mathematical induction, recursive definitions, and structural induction, sets and set operations, functions, growth of functions, basics of counting, permutations and combinations, Binomial theorem, relations and their properties, representing relations, equivalence relations, introduction to graphs, graph terminology, introduction to trees.		

MATH 211	**Calculus III**	**4(4,0)**
Hyperbolic functions and their inverses, infinite sequences and series, polar coordinates, cylinders and quadric surfaces, functions of several variables, partial derivatives, Multiple integrals in rectangular, cylindrical, and spherical coordinates, substitutions.		

MATH 311	**Linear Algebra with Applications**	**3(3,0)**
Systems of linear equations, matrix algebra, linear transformations, determinants, vector spaces, eigenvalues and eigenvectors, symmetric matrices, orthogonality, diagonalization.		

MATH 314	**Ordinary Differential Equations**	**3(3,0)**
First order linear differential equations, linear differential equations of second and higher order, linear differential equations with variable coefficients, series solutions, Legendre's and Bessel's equations, systems of differential equations, Laplace transforms and their inverses. **Prerequisite:** MATH 211.		

MATH 317	**Partial Differential Equations**	**3(3,0)**
Introduction to the theory, solutions, and applications of partial differential equations. Methods of solving first order linear differential equations, method of characteristics: Lagrange theorem, boundary conditions of first order equations, non-linear first order pde's, Charpit's equations, the complete integral, Clairaut's equation, and other types, envelope and singular solutions, second order pde's, classification: hyperbolic,		

parabolic, and elliptic, the method of separation of variables, introduction to Fourier series and integrals, boundary value problems: heat equation, wave equation, and Laplace equation. **Prerequisite**: MATH 314.

MATH 421	**Numerical Analysis**	**3(3,0)**
Error Analysis, solutions of nonlinear equations using fixed point- Newton-Raphson-Muller's methods, solution of linear system using Gaussian elimination-iterative methods, interpolation and approximation using Taylor series-Lagrange approximation-Newton polynomials, numerical differentiation and integration, numerical optimization, solutions of ordinary and partial differential equations using Euler's and Heun's and Rung-Kutta methods. **Prerequisite**: MATH 311.		

E. Science Courses

Description of required Sciences courses are given below.

BIOL 210	**Human Anatomy and Physiology and Lab**	**3(2,2)**
A general overview that deals with cell structure and function and physiology, anatomy, and physiology of the human body systems. These include cardiovascular, central nervous, respiratory, urinary, digestive, immune, and musculoskeletal systems. The course also offers a set of experiments that deal with basic biological processes and advanced biological assessments. **Prerequisite**: None.		

CHEM 210	**Principles of Chemistry**	**3(3,0)**
This course emphasizes the fundamental principles of chemistry including stressing atomic structure, bonding, stoichiometry, gases, solutions, acids and bases, solution equilibria. Prerequisite: None.		

CHEM 211	**Environmental Chemistry and Lab**	**3(2,2)**
This course provides an opportunity to develop an understanding of several basic environmental functions, the complicated nature of environmental systems, and the need for multidisciplinary solutions to environmental problems. Topics covered include the hydrosphere, water quantity and quality, soil and the soil ecosystem, biological resources, waste disposal, air pollution, ozone depletion, acid rain, global warming. The course also includes a set of experiments that offer students practical experience in different environmental analysis settings including air and water quality. **Prerequisite**: None.		

GEOL 221	**Fundamentals of Geology**	**3(3,0)**
Physical and chemical properties of earth, structure of the earth, plate tectonic theory and continental drift, volcanism; mountain building processes, surface processes, mineralogy, formation and classification of rocks, earth hazards, geological problems related to civil engineering such as landslide and earthquake, geologic maps, geophysical exploration methods, earth works and tunneling. **Prerequisite**: None. Annually.		

PHYS 210	**Fundamentals of Physics and Lab**	**3(3,1)**

Welcome to the Introductory Physics course. This course consists of: Review of Classical Mechanics, Fluid Mechanics, General Properties of Waves, Electric Forces, Electric Fields for Discrete and Continuous Charge Distribution, Gauss's Law, Electric Potential, Kirchhoff's Rules, Magnetic Fields and Forces, Qualitative Discussion of Maxwell's Equations. **Prerequisite**: None.

PHYS 211	**Physics: Electricity and Magnetism and Lab**	**3(3,1)**
This course covers fundamental topics in Electricity and Magnetism: Electric forces and Electric Fields for discrete and continuous charge distribution, Gauss's Law, Electric Potential, Capacitance and Dielectrics, Kirchhoff's rules, Magnetic Fields and Forces, Biot-Savart Law, Ampere's Law, Magnetic Flux and Gauss's Law in Magnetism. It also includes a laboratory component that introduces students to the "real world" by offering a set of experiments in electricity and magnetism. **Prerequisite**: None.		

PHYS 312	**Modern Physics**	**3(3,0)**
This course introduces the principles of revolutionary developments of the 20th century. It covers interaction of light and matter (Photoelectric effect, Compton, Auger, etc.), the dual nature of light, various models of atomic description, quantum numbers, relativistic approach, Heisenberg Uncertainty Principle, Schrodinger Equation, and an introduction to the band theory of solids and to particle physics.		

F. Independent Study Courses

The College of Engineering offers an Independent Study course option at the undergraduate level. Typically, a maximum of two independent studies (totaling not more than 6 credits) may be counted towards your degree as part of your technical elective credits. To begin an Independent Study, you must come to an agreement with a faculty member who is willing to supervise your work. The supervisor must either be a full-time College of Engineering faculty member or affiliated with one of the engineering departments at the college. The faculty member approves the specific number of credits the proposed work will qualify for, approves a reading list, and meets with you periodically to discuss the reading and your overall progress. 'Independent Study' courses are created by students who work with a faculty member to explore a topic of mutual interest. Students and faculty in Engineering use independent study courses for several purposes, including a capstone design and/or experimental project, conducting research, or writing a substantial research paper.

Registering for an Independent Study

Follow this procedure to register for an independent study:

1. Identify a faculty advisor, and work with him or her to decide on the content and structure for your course, including the way to assess your work, and setting up the work timeframe.
2. Complete the "independent study proposal form".
3. Once your form is submitted, your faculty advisor will review the application. She/ He will either issue his approval and forward it to the corresponding department

chair or ask you to revise and resubmit your application. You will be notified by email once you can register for the course after final approval is issued by the college.

ENGR 597	Independent Study I	3(3,0)
This course provides students with the possibility to explore new academic research/study that may not be available in regular courses. The student needs to identify a faculty advisor from within his/her department, and work with him/her to decide on the content and structure for the work, including the way to assess student's work, and setting up the work timeframe. The student needs to complete the "independent study proposal form" which includes an abstract identifying the nature of the research work, goals, and expected outcomes, and submit it to the faculty advisor. Once the form is submitted, the faculty advisor will review the application. She/ He will either issue her/his approval and forward it to the corresponding department chair or ask the student to revise and resubmit the proposal form or deny it. The student will be notified by email after final approval is issued by the college. The faculty member approves the specific number of credits the proposed work will qualify for, approves a reading list, and meets with the student periodically to discuss the reading and the overall progress. At the end of the semester, the student is required to submit a paper, or a project report acceptable by the faculty supervisor. This course is subject to the same rules and regulations for dropping and withdrawing as any other regular course. **Prerequisite**: Senior Standing		

ENGR 598	Independent Study II	3(3,0)
This course provides students with the possibility to explore new academic research/study that may not be available in regular courses. The student needs to identify a faculty advisor from within his/her department, and work with him/her to decide on the content and structure for the work, including the way to assess student's work, and setting up the work timeframe. The student needs to complete the "independent study proposal form" which includes an abstract identifying the nature of the research work, goals, and expected outcomes, and submit it to the faculty advisor. Once the form is submitted, the faculty advisor will review the application. She/ He will either issue her/his approval and forward it to the corresponding department chair or ask the student to revise and resubmit the proposal form or deny it. The student will be notified by email after final approval is issued by the college. The faculty member approves the specific number of credits the proposed work will qualify for, approves a reading list, and meets with the student periodically to discuss the reading and the overall progress. At the end of the semester, the student is required to submit a paper, or a project report acceptable by the faculty supervisor. This course is subject to the same rules and regulations for dropping and withdrawing as any other regular course. **Prerequisite**: Senior Standing.		

III. Program Requirements

Requirements for the Bachelor of Science and Bachelor of Engineering degrees are program specific. They encompass two categories: Major and non-major. Each category consists of a set of mandatory courses and a set of elective courses. The program

requirements for the Bachelor of Science and Bachelor of Engineering degrees in the different engineering majors are given in the forthcoming sections. Details and titles of relevant courses are included in the Student's Study Plan (SSP) that every engineering student will have.

Course Coding

The courses offered by the College of Engineering programs are designated according to the following coding System (xxxx abc):

xxxx	Program as indicated above
abc	"a" designate the Year or level 1, 2, 3, 4; "b" program focus area; "c" course sequence - 0, 1, ..., 9

The designation used to represent credit hours breakdown c (t, p) of a course is as follows: "c" the total credit hours, "t" stands for theoretical component of the course; "p" practical or laboratory component. For example, 3(3, 0) represents a 3-credit hour course with three contact lecture hours and zero laboratory hours.

Learning Support Center

The learning Support Center (LSC) at the College of Engineering is another manifestation of RHU's resolute commitment to students' academic success. The LSC offers the students a peer-to-peer learning opportunity that complements classroom learning. The Center aims to support students in advancing their knowledge and skills, reinforcing what they learn in the classrooms or overcoming learning and performance difficulties. In addition to being a focal-point for enquiry and two-way "asker-replier" learning, the LSC offers the space for academic interactions that can trigger enhanced learning significantly.

The Center is in room D205 and is open to all students throughout the week. The LSC is staffed by Teaching Assistants of graduate students and upper-level undergraduate students who are always available and ready to assist their fellow students in overcoming their academic challenges. Additionally, "on-call" faculty members are assigned to ensure that the LSC is performing to the best interest of the students.

The center's resources portfolio includes books, study guides, course materials, boards, computers, videos, DVD's, documentaries, large screen LCD panels, and internet connected PCs.

My Idea to Innovate

The *My Idea to Innovate* (ENGR 499 – 3 credits) is an open course that aims to encourage innovation. A student or a group of students who have a passion for and a dream to nurture and pursue an innovative idea of their own may collaborate with faculty

mentors to design the course to cover topics and experiences that could not be achieved within the course offering framework of the concerned program and require collaboration across disciplines and/or fields. Course contents, prerequisites, number of credits, scope, experiences, needed resources, outcomes, assessment tools and rubrics, and timeline for completion will be formulated by the students(s) and the faculty mentor(s) once the idea is approval by the University Academic Board. Student(s) supported by faculty advisor(s) may request approval to design and offer the course after the first year of studies at RHU. The course could count for technical elective credits.

CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT (CEE)

Faculty Members

Chairperson:	Meheddene Machaka
Associate Professors:	Meheddene Machaka, Riad Al Wardany,
Assistant Professor:	Rana Hajj Chehade
Adjunct Faculty:	Nada Reslan
Instructor:	May Mrad

Programs Offered

Currently the CEE Department offers one program in Civil Engineering leading to a Bachelor of Science, Bachelor of Engineering and Master of Science degrees, all in Civil Engineering.

CIVIL ENGINEERING PROGRAM

Mission

The mission of the Civil & Environmental Department at Rafik Hariri University is fourfold:

- To provide high quality education at the undergraduate and graduate levels.
- To prepare students for successful careers in the civil engineering work fields and research.
- To equip students with the will and tools to engage in lifelong learning, teamwork, team leading, and continual professional development.
- To cultivate in students habitual ethical and tolerant behavior and the desire to positively contribute to the advancement of their community and their profession.

Objectives

The program educational objectives of the Civil Engineering program intend to enable its graduates within a few years of graduation to:

- Establish themselves as practicing professionals in civil engineering or a related field.
- Pursue graduate study in civil engineering or other fields.
- Effectively function as team members and as team leaders.
- Understand professional practice issues and demonstrate a commitment to professional licensure and continuing education.
- Participate in and contribute to professional societies and community services.

Program Outcomes

The Civil & Environmental Engineering Department adopts ABET Student Learning Outcomes as the Civil Engineering (CIVE) Program outcomes. Conforming to the Program Objectives, graduates of the CIVE Program will acquire each of the following abilities and characteristics:

a. Ability to apply knowledge of mathematics, science, and engineering.
b. Ability to design and conduct experiments, as well as to analyze and interpret data.
c. Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. Ability to function on multidisciplinary teams.
e. Ability to identify, formulate, and solve engineering problems.
f. Understanding of professional and ethical responsibility.
g. Ability to communicate effectively.

h. Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
i. Recognition of the need for, and an ability to engage in life-long learning.
j. Knowledge of contemporary issues.
k. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Accreditation

The Bachelor of Engineering program in Civil Engineering has been accredited by the Engineering Accreditation Commission (EAC) of **ABET**, 415 North Charles Street, Baltimore, MD 21201; www.abet.org.

Career Opportunities

Civil engineers attain a broad spectrum of skills sought after by a wide range of professions. Industrial sectors, enterprises, and services in which a civil engineer can pursue a career include construction, infrastructure, transportation, consulting, water resources, environmental, government and other public work sections. Most importantly, students will be endowed with skills to pursue entrepreneurial ventures that enable to realize their own new ideas. There is so much work to be done to fashion a better future and civil engineers can be major contributors to that objective.

Program Overview

The Civil Engineering Program at Rafik Hariri University puts what is in the best interest of students, first and foremost. Every little experience the student attains represents a block in the building of a competent, confident, purposeful, problem solving, competitive, responsible, and conscientious individual. This is accomplished by means of a curriculum and facilities that conform to the highest of standards, faculty members committed to the academic and personal growth of the student, and an environment that inspires learning and drives creativity.

The Bachelor of Engineering (BE) program in Civil Engineering encompasses 147 credit hours spread over eight regular semesters and three summer semesters. The Bachelor of Science (BS) program comprises a total of 114 credit hours spread over six regular semesters and three summer semesters. In addition to completing the credits requirements, a BS or a BE degree is conferred upon a student if the earned Cumulative GPA, Major GPA and the Summative Learning Project grade are all 70 or above.

The required credit hours span three categories: University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours for the BS and BE programs are shown in the following table:

BS Program in Civil Engineering (114 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	0	0	21	6	27	24
College Requirement	0	0	25	0	25	22
Program Requirement	53	0	9	0	62	54
Credits	53	0	55	6	114	100

BE Program in Civil Engineering (147 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	0	0	21	9	30	20
College Requirement	0	0	28	0	28	19
Program Requirement	65	15	9	0	89	61
Credits	65	15	58	9	147	100

I. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Engineering section in this catalog.

II. College Requirements

The list of the College required courses and their descriptions are presented in the introductory pages of the College of Engineering section in this catalog.

III. Program Requirements

The program requirements for a Bachelor of Engineering degree in Civil Engineering encompasses 86 credits (59 credits for the BS degree) distributed as follows: 71 credits (59 credits for the BS degree) Mandatory courses and 15 credits elective courses. Both categories are summarized below.

A. Mandatory requirements

The major and non-major CIVE program mandatory courses are listed in the table below.

Course #	Title	Credits	Prerequisites
CIVE 200	Introduction to Civil Engineering	2	
CIVE 202	Civil and Architectural Drawings	3	
CIVE 211	Statics	3	
CIVE 240	Surveying	3	

CIVE 312	Structural Analysis I	3	MECH 320
CIVE 314	Concrete I	3	MECH 320
CIVE 321	Construction Materials	3	
CIVE 321L	Construction Materials Lab	1	Co-req: CIVE 321
CIVE 341	Highway Engineering	3	CIVE 240
CIVE 342	Transportation Engineering	3	CIVE 341
CIVE 400*	Summative Learning (BS) Project	3	ENGL 217 Senior Standing
CIVE 413	Computer Modeling of Structures	3	CIVE 312
CIVE 415	Concrete II	3	CIVE 312 and CIVE 314
CIVE 417	Steel Structures	3	CIVE 312
CIVE 423	Soil Mechanics	3	MECH 320; GEOL 221
CIVE 423L	Soil Mechanics Laboratory	1	Co-req.: CIVE 423
CIVE 424	Foundation Engineering	3	CIVE 423
CIVE 432	Environmental Engineering	3	CHEM 211
CIVE 435	Hydraulics	3	MECH 333
CIVE 499	Co-op Work Experience	1	ENGL 217; Senior Standing
CIVE 501	Construction Planning and Management	3	Senior Standing
CIVE 507	Structural Analysis II	3	CIVE 312
CIVE 536	Hydrology	3	CIVE 435
CIVE 538	Water and Wastewater Treatment	3	CIVE 432, CIVE 435
CIVE 595A	BE Summative Learning Project 1	1	Senior Standing
CIVE 595B	BE Summative Learning Project 2	2	CIVE 595A
CIVE 5xx	Technical Electives I-V	15	Per course requirements
MECH 220	Dynamics	3	CIVE 211
MECH 320	Mechanics of Materials	3	CIVE 211
MECH 333	Thermal Fluid Sciences	3	MATH 211

* Required for BS bound students. BE students take a technical elective instead.

The civil engineering courses provide coverage in five areas as listed in the following table.

Code	Course Title	Credits	Prerequisite
Common Courses and Construction Management			
CIVE 200	Introduction to Civil Engineering	2	
CIVE 202	Civil and Architectural Drawings	3	
CIVE 595	BE Summative Learning Project (A + B)	3	Senior standing
CIVE 501	Construction Planning and Management	3	Senior standing
Structural Analysis & Design			
CIVE 211	Statics	3	
CIVE 312	Structural Analysis I	3	MECH 320
CIVE 314	Concrete I	3	MECH 320
CIVE 413	Computer Modeling of Structures	3	CIVE 312

CIVE 415	Concrete II	3	CIVE 312 and CIVE 314
CIVE 417	Steel Structures	3	CIVE 312
CIVE 507	Structural Analysis II	3	CIVE 312
Construction Materials & Geotechnics			
CIVE 321	Construction Materials	3	
CIVE 321L	Construction Materials - Laboratory	1	Co-req: CIVE 321
CIVE 423	Soil Mechanics	3	MECH 320 & GEOL 221
CIVE 423L	Soil Mechanics Laboratory	1	Co-req.. CIVE 423
CIVE 424	Foundation Engineering	3	CIVE 423
Water Resources & Wastewater Treatment			
CIVE 432	Environmental Engineering	3	CHEM 211
CIVE 435	Hydraulics	3	MECH 333
CIVE 536	Hydrology	3	CIVE 435
CIVE 538	Water and Wastewater Treatment	3	CIVE 432, CIVE 435
Public Works			
CIVE 240	Surveying	3	
CIVE 341	Highway Engineering	3	CIVE 240
CIVE 342	Transportation Engineering	3	CIVE 341

B. Technical Electives

As part of the program for the Bachelor of Engineering in Civil Engineering, the student is required to complete 15 credit hours of technical elective courses. These courses allow the student to attain in-depth knowledge and understanding in a focus area of interest. The student can mix and match elective courses from different areas to acquire broader knowledge in different Civil Engineering disciplines. The student should select, in cooperation with the academic advisor, the set of electives that best meet his or her needs and aspirations. The CIVE available technical elective courses are distributed in five areas:

1. Construction Management
2. Structural Analysis and Design
3. Construction Materials and Geotechnics
4. Water Resources & Wastewater Treatment
5. Public Works

It is highly recommended that the student takes elective courses from the list below after completing the mandatory requirements in the related area. Students may select technical electives from other programs subject to approval of the academic advisor and the corresponding course instructor.

Course #	Title	Credits	Prerequisites
Construction Management Sequence			
CIVE 502	Engineering Risk Analysis	3	MATH 351
CIVE 503	Computer Methods in Civil Engineering	3	Senior Standing

CIVE 504	Infrastructure Asset Management	3	Senior Standing
CIVE 506	LEED Principles in Construction Management	3	Senior Standing
Structural Analysis and Design Sequence			
CIVE 510	Finite Elements Analysis	3	CIVE 312
CIVE 511	Structural Dynamics	3	CIVE 312
CIVE 514	Earthquake Engineering	3	CIVE 312
CIVE 515	Prestressed Concrete	3	CIVE 415
CIVE 519	Tall Building Structures	3	CIVE 413
Construction Material and Geotechnics Sequence			
CIVE 521	Special Concretes	3	CIVE 321
CIVE 522	Durability of Construction Materials	3	CIVE 321
CIVE 523	Repair of Concrete Structures	3	CIVE 321
CIVE 524	Nondestructive Evaluation and Instrumentation of Infrastructure	3	CIVE 321
CIVE 525	Concrete Technology	3	CIVE 321
CIVE 526	Admixtures for Concrete	3	CIVE 321
CIVE 527	Seepage and Dams	3	CIVE 424 Co-req.: CIVE 536
CIVE 528	Earth Retaining Structures	3	CIVE 314, 424
CIVE 529	Advanced Foundation Engineering	3	CIVE 424
Water and Environmental Engineering Sequence			
CIVE 571	Water Quality	3	CIVE 432
CIVE 573	Solid Waste Management	3	CIVE 432
CIVE 575	Water Supply & Wastewater Systems	3	CIVE 435
Public Works Sequence			
CIVE 540	GIS for Civil Engineering	3	Senior Standing
CIVE 541	Pavement Design	3	CIVE 423

C. Summative Learning Project

Students must complete a 3- credit hours course for BS (3-credits for BE; taken 1 credit in the first regular semester and 2 credits in the following regular semester) in which they work preferably in groups on a problem of concern to industry or the community at large, or to innovate a promising idea. The SLP could be an extension of the projects students had worked on in the Engineering for the community course to bring it to a more useful outcome.

D. Co-op Experience

Students must complete 8 weeks of practical training in working in an area related to his/her field of interest. The Co-op experience is usually fulfilled during the summer semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on student's progress throughout the Co-op period by conducting field visits and ensure that student's performance is aligned with his/her aspirations and employer's needs. Students are required to submit a formal report, a poster and make a formal

presentation about their Co-op experience. While ENGL 217 and senior standing are the essential prerequisites to pursue the co-op training, the program has the mandate to require stipulate additional conditions.

Study Plan

The following study plan summarizes the courses and credits distribution for the Bachelor of Science (BS) and Bachelor of Engineering (BE) in CIVE Engineering. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course No.	Title	Credits	Prerequisites
Year 1, Fall Semester (16 Credits)			
CCEE 214	Introduction to Programming	3	
CIVE 211	Statics	3	
ENGL 210	English Composition and Rhetoric	3	Placement
MATH 211	Calculus III	4	
PHYS 210	Fundamentals of Physics and Lab	3	
Year 1, Spring Semester (17 Credits)			
ARAB 212	Arabic Language & Communication	2	
CHEM 210	Principles of Chemistry or Science Elective	3	
CIVE 200	Introduction to Civil Engineering	2	
CMNS 200	Etiquette	1	Co-req.: ENGL 210
GEOL 221	Fundamentals of Geology	3	
MATH 311	Linear Algebra and Applications	3	
MECH 320	Mechanics of Materials	3	CIVE 211
Year 1, Summer Semester (9 Credits)			
CHEM 211	Environmental Chemistry and Lab	3	
CIVE 240	Surveying	3	
	Social Sciences	3	
Year 2, Fall Semester (16 Credits)			
CIVE 312	Structural Analysis I	3	MECH 320
CIVE 321	Construction Materials	3	
CIVE 321L	Construction Materials - Laboratory	1	Co-req: CIVE 321
CIVE 341	Highway Engineering	3	CIVE 240
MATH 314	Ordinary Differential Equations	3	MATH 211
MECH 220	Dynamics	3	CIVE 211
Year 2, Spring Semester (18 Credits)			
CIVE 202	Civil and Architectural Drawings	3	
CIVE 314	Concrete I	3	MECH 320
CIVE 342	Transportation Engineering	3	CIVE 341
ENGL 217	Professional English	3	ENGL 210
MATH 351	Probability and Statistics	3	MATH 211
MECH 333	Thermal Fluid Sciences	3	MATH 211
Year 2, Summer Semester (6 Credits)			

ELEC 210	Electric Circuits	3	PHYS 191 or Equivalent
ENGR 300	Engineering Economics & Management	3	
Year 3, Fall Semester (16 Credits)			
CIVE 413	Computer Modeling of Structures	3	CIVE 312
CIVE 415	Concrete II	3	CIVE 312 and CIVE 314
CIVE 423	Soil Mechanics	3	MECH 320 & GEOL 221
CIVE 423L	Soil Mechanics Laboratory	1	Co-req.: CIVE 423
CIVE 435	Hydraulics	3	MECH 333
CIVE 432	Environmental Engineering	3	CHEM 211
Year 3, Spring Semester (15 Credits)			
CIVE 417	Steel Structures	3	CIVE 312
CIVE 424	Foundation Engineering	3	CIVE 423
CIVE 507	Structural Analysis II	3	CIVE 312
MATH 421	Numerical Analysis	3	MATH 311
	Engineering Technical Elective I*	3	Per course requirements
Year 3, Summer Semester (1 Credit)			
CIVE 499	Co-op Work Experience	1	ENGL 217; Senior Standing
The above 114 credits complete the requirements for a Bachelor of Science degree in Civil Engineering.			
Year 4, Fall Semester (16 Credits)			
CIVE 501	Construction Planning and Management	3	Senior standing
CIVE 595A	BE Summative Learning Project 1	1	ENGL 217, senior standing
ENGR 510	Engineering Project Management	3	ENGR 300
	Engineering Technical Elective II	3	Per course requirements
	Engineering Technical Elective III	3	Per course requirements
	Humanities / Fine Arts Elective	3	
Year 4, Spring Semester (17 Credits)			
CIVE 536	Hydrology	3	CIVE 435
CIVE 538	Water and Wastewater Treatment	3	CIVE 432, CIVE 435
CIVE 595B	BE Summative Learning Project 2	2	CIVE 595A
	Engineering Technical Elective IV	3	Per course requirements
	Engineering Technical Elective V	3	Per course requirements
	Social Science Elective	3	

* BS bound students are required to take CIVE400 - Summative Learning (BS) Project instead.
Note: Engineering Technical Electives (levels 400 or above) are selected as such:
6 credit restricted Departmental Electives
9 credits from any Engineering discipline of levels 400 or above.

Course Coding

The courses offered in the Civil Engineering program are designated code numbers in the form of (CIVE abc) where:

a	Year (level): 2 = first year, 3 = second Year, 4 = Third year, 5 = Fourth Year
b	Concentration Areas (as follows) 0: Common Courses and Construction Management; 1: Structural Analysis and Design; 2: Construction Materials and Geotechnics; 4: Public Works; 7: Water Resources and Treatment;
c	Course sequence in area: 0, 1, …, 9

Courses Description

I. Mandatory Courses

Non Major Courses

Description of the non-major mandatory courses follows.

CHEM 210	**Principles of Chemistry**	**3(3,0)**
This course emphasizes the fundamental principles of chemistry including stressing atomic structure, bonding, stoichiometry, gases, solutions, acids and bases, solution equilibria. Prerequisite: None.		

CHEM 211	**Environmental Chemistry and Lab**	**3(2,2)**
This course provides an opportunity to develop an understanding of several basic environmental functions, the complicated nature of environmental systems, and the need for multidisciplinary solutions to environmental problems. Topics covered include the hydrosphere, water quantity and quality, soil and the soil ecosystem, biological resources, waste disposal, air pollution, ozone depletion, acid rain, global warming. The course also includes a set of experiments that offer students practical experience in different environmental analysis settings including air and water quality.		

COSC 214	**Introduction to Programming**	**3(2,2)**
This course presents the fundamentals of structured and modular programming concepts. It covers primitive data types, expressions, control statements, functions, arrays, basic searching/sorting algorithms, and introduction to pointers. **Prerequisite**: None. Equivalent to CCEE 214.		

ELEC 210	Electrical Circuits	3(3,0)
Circuit elements and laws, mesh and node equations, network theorems, energy storage elements, RC, RL, and RLC circuits, Laplace Transform, sinusoids and phasors and introduction to network theory. Sinusoidal (AC) steady state, mutual inductance, transformers, and introduction to three phase circuit. **Prerequisite**: PHYS 191 or Equivalent		

ENGL 210	English Composition and Rhetoric	3(3,0)
This course reviews the fundamentals of good academic writing in English, teaches essay writing essentials and research skills in two rhetorical modes (persuasion and argumentation), and provides practice in writing essays in these modes, research paper, and oral presentation. **Prerequisite:** ENGL 101 or TOEFL 550+ (paper) or 80+ (computer).		

ENGL 217	Professional English Communication	3(3,0)
This is a required course designed to help students develop effective professional communication skills, both orally and in writing. In this course, students learn how to write emails, memos, letters, proposals, reports, and other forms of employment correspondence. In addition, this course helps students sharpen their presentation skills. Broadly, this course enables students to behave professionally and effectively in their prospective jobs. **Prerequisite**: ENGL 210.		

ENGR 300	Engineering Economics and Management	3(3,0)
Concepts and techniques in basic Engineering economy principles and applications. Interest and financial mathematics; present worth, annual worth, benefit/cost ratio, internal rate of return, multiple alternatives, income tax, inflation, Risk analysis, Investment and investment choice, equivalence, loans, cost of capital, retirement and replacement, sector analysis and viewpoint, sensitivity analysis, accounting, and financial statements. **Prerequisite**: None. Annually.		

ENGR 510	Engineering Project Management	3(3,0)
The course covers key components of engineering project management including projects election and planning, project time management, cost estimation and pricing, contract and specifications, quality management, engineering ethics and professional conduct, realizing impact of engineering solutions in various contexts (global, economic, environmental, societal, etc...), sustainability in engineering designs, human resources consideration, communications, risk management, and procurement management. **Prerequisite:** ENGR 300.		

MATH 211	Calculus III	4(4,0)
Hyperbolic functions and their inverses, infinite sequences and series, polar coordinates, cylinders and quadric surfaces, functions of several variables, partial derivatives, Multiple integrals in rectangular, cylindrical, and spherical coordinates, substitutions.		

MATH 311	Linear Algebra with Applications	3(3,0)
Systems of linear equations, matrix algebra, linear transformations, determinants, vector spaces, eigenvalues and eigenvectors, symmetric matrices, orthogonality, diagonalization.		

MATH 314	Ordinary Differential Equations	3(3,0)
First order linear differential equations, linear differential equations of second and higher order, linear differential equations with variable coefficients, series solutions, Legendre's and Bessel's equations, systems of differential equations, Laplace transforms and their inverses. **Prerequisite:** MATH 211.		

MATH 351	Probability and Statistics	3(3,0)
Probability and conditional probability, Discrete and continuous random variables, marginal distributions, expectation, variance-mean-median-covariance and correlation, conditional expectation, binomial, multinomial and Poisson distributions, Normal distribution, Sampling distribution, Prediction and confidence intervals, Hypothesis testing. **Prerequisite**: MATH 211.		

MATH 421	Numerical Analysis	3(3,0)
Error Analysis, solutions of nonlinear equations using fixed point- Newton-Raphson-Muller's methods, solution of linear system using Gaussian elimination-iterative methods, interpolation and approximation using Taylor series-Lagrange approximation-Newton polynomials, numerical differentiation and integration, numerical optimization, solutions of ordinary and partial differential equations using Euler's and Heun's and Rung-Kutta methods. **Prerequisite**: MATH 311.		

MECH 220	Dynamics	3(3,0)
Brief review of statics; proper use of different coordinate systems: Cartesian and normal/tangential axes; kinematics of a particle: rectilinear, curvilinear, and relative motion; kinetics of a particle: force and acceleration, work and energy, impulse and momentum; planar kinematics of a rigid body: translating and rotating axes, absolute and relative motion; planar kinetics of a rigid body: force and acceleration, work and energy, impulse and momentum. **Prerequisite**: CIVE 211. Annually.		

MECH 320	Mechanics of Materials	3(3,0)
Mechanical stress, strain, and stress/strain relations under pure tension, compression, pure bending, and pure torsion of circular bars; 1-D thermal strain & stress; combined stresses; principal stresses; plane stress transformation & Mohr's circle; basic 3-D elastic stress/strain relations; Euler-elastic buckling of columns. **Prerequisite**: CIVE 211. Annually.		

MECH 333	Thermal Fluid Sciences	3(3,0)
This course seeks to impart thermal-fluid fundamental concepts (including Thermodynamics, Fluid Mechanics and Heat Transfer) to non-mechanical engineering students. These covers: thermodynamic state and properties of pure substances; concepts of work and heat, energy analysis of closed systems (First Law) and simple		

flow devices, Fluid statics; Bernoulli's equation; Conservation of mass, momentum & energy, viscous flow in pipes, introduction to conduction, convection, and radiation heat transfer. **Prerequisite**: MATH 211. Annually.

PHYS 210	**Fundamentals of Physics and Lab**	**3(3,1)**
Welcome to the Introductory Physics course. This course consists of: Review of Classical Mechanics, Fluid Mechanics, General Properties of Waves, Electric Forces, Electric Fields for Discrete and Continuous Charge Distribution, Gauss's Law, Electric Potential, Kirchhoff's Rules, Magnetic Fields and Forces, Qualitative Discussion of Maxwell's Equations. **Prerequisite**: None.		

Major Courses

Description of the civil engineering mandatory courses follows.

CIVE 200	**Introduction to Civil Engineering**	**2(2,0)**
A broad introductory course that exposes students to the history and heritage of civil engineering; specialized sub disciplines (Structural, Transportation, Construction Materials, Geotechnical, Environmental); challenges of civil engineering profession; professionalism and professional registration and societies; Codes and Standards. This course also introduces students to the business aspects of the civil engineering profession, including construction management, and engineering economics.		

CIVE 202	**Civil and Architectural Drawings**	**3(2,2)**
Essential engineering concepts of drawings for civil and architectural applications, computer drafting skills in 2D and 3D are taught and implemented in producing floor plans, sections, elevations and reinforcement detailing for reinforced concrete elements. Emphasis is directed at teaching students proper placement of symbols, annotation, and scheduling information required for site construction. **Prerequisite**: None. Annually.		

CIVE 211	**Statics**	**3(3,0)**
Static laws; force vectors and operations; force system and moment; free body diagram; equilibrium of particles and rigid bodies in 2D and 3D; plane trusses and frames; cables; internal forces: shear and moment diagrams; centroid and center of mass; moment of inertia; and friction. **Prerequisite**: None. Annually.		

CIVE 240	**Surveying**	**3(2,2)**
Surveying fundamentals; theory of errors in observations; leveling; distance measurement; angles, azimuths, and bearings; traversing; topographic surveys and maps. The course also has field component in which students work in groups to conduct survey works in the learned topics and write technical reports. **Prerequisite**: None. Annually.		

CIVE 312	**Structural Analysis I**	**3(3,0)**
Shear and bending moment diagrams for frames, equilibrium, stability, and determinacy; influence lines for determinate structures; Elastic deformation of		

beams, frames, and trusses; introduction to indeterminate structures; approximate analysis of indeterminate building frames. **Prerequisite**: MECH 320. Annually.

CIVE 314	**Concrete I**	**3(3,0)**
Behavior of reinforced concrete structural elements; concepts of design and proportioning sections for strength and serviceability; theory of flexure and shear; analysis and design of beams for flexure and shear; analysis for crack width and deflection; design philosophies and process; design of one way solid and joist slabs; bond theory; development, anchorage and splicing of reinforcement; bars cut-off; continuous beams and one-way slabs. **Prerequisite**: MECH 320. Annually.		

CIVE 321	**Construction Materials**	**3(3,0)**
Properties and tests of materials used in construction of civil structures such as aggregate, cement, mixing water, admixtures, steel, masonry, Portland cement concrete, asphalt concrete and timber; laboratory and field measurement techniques to assess material properties and performance; emphasis on fresh and hardened concrete, types of concrete and applications, and concrete mix design. Annually.		

CIVE 321L	**Construction Materials Laboratory**	**1(0,2)**
Los Angeles abrasion test; specific gravity and absorption of coarse and fine aggregates and soils; moisture content; bulk unit weight and voids in aggregates and soils; sieve analysis; concrete mix design; mixing concrete and slump test; compressive strength of concrete; absorption, moisture content and density of concrete masonry units. Report writing and data analysis. **Co-req**: CIVE 321. Annually.		

CIVE 341	**Highway Engineering**	**3(3,0)**
Introduction to highway engineering standards; types and classifications of roads; characteristics of the driver, the pedestrian, the vehicle and the road, highway location and survey methods; earthwork, geometric design of highway components: vertical and horizontal alignment, transition curves, super-elevations and intersections, highway materials and evaluations, construction techniques and plants, quality control and testing, visual assessment, and maintenance. **Prerequisite**: CIVE 240. Annually.		

CIVE 342	**Transportation Engineering**	**3(3,0)**
Social and economic impact of transportation engineering on the society; basis of traffic engineering; transportation planning; traffic flow theory; traffic studies and analysis; travel demand modeling and forecasting; queuing theory; capacity analysis; level of service; traffic control and analysis at signalized intersections. **Prerequisite**: CIVE 341. Annually.		

CIVE 400	**Summative Learning (BS) Project**	**3(3,0)**
Team-oriented, project-based experience where students work on a meaningful problem of concern to industry or the community at large, or to innovate a promising idea. The project involves whatever it takes to reach the intended project outcome:		

literature review, design work, data collection, experimentation, data analysis, report writing and presentation. **Prerequisite**: ENGL 217 and Senior Standing. Annually.

CIVE 413	**Computer Modeling of Structures**	**3(3,0)**
Principles of structural modeling of different types of structural elements: trusses, beams, columns, and frames; modeling the structural behavior of buildings under the effect of vertical and lateral loads, computational applications using structural analysis software; case studies and project. **Prerequisite**: CIVE 312. Annually.		

CIVE 415	**Concrete II**	**3(3,0)**
Short columns, slender columns, uniaxially and biaxially bent columns; two-way slabs behavior, analysis and design; retaining walls; wall footings, concentrically and eccentrically loaded single column footings, and combined footings; staircases. **Prerequisite**: CIVE 312 and CIVE 314. Annually.		

CIVE 417	**Steel Structures**	**3(3,0)**
Structural steel properties, loads, design methods, analysis, and design of members of steel structures: tension members, compression members, flexure members and connections. **Prerequisite**: CIVE 312. Annually.		

CIVE 423	**Soil Mechanics**	**3(3,0)**
Soil classification; origin of soil and grain size; soil structure, weight-volume relationships; plasticity and structure of soil; soil compaction; permeability; seepage, stresses in a soil mass; compressibility of soil and consolidation; shear strength of soil. Prerequisites: MECH 320 and GEOL 221. Annually.		

CIVE 423L	**Soil Mechanics Laboratory**	**1(0,2)**
Experimental testing of soil: Sieve Analysis, Atterberg Limits; Proctor test; sand cone field density measurement; consolidation and direct shear test; report writing and data analysis. Co-requisite: CIVE 423. Annually.		

CIVE 424	**Foundation Engineering**	**3(3,0)**
Geotechnical site investigation; field and laboratory tests; characterization of strata; foundation systems; ultimate bearing capacity and settlement of shallow foundations (spread footings, strip footings, combined footings, and mat); effect of water table level on bearing capacity; structural design of mat foundations; ultimate bearing capacity and settlement of deep foundations (single pile and group of piles); pile load test. **Prerequisite**: CIVE 423. Annually.		

CIVE 432	**Environmental Engineering**	**3(3,0)**
Chemical and biological processes related to environmental science and engineering, materials and energy balances; environmental systems analysis with application to air, water and soil; hydrology; water treatment; water quality management; wastewater treatment; air pollution; noise pollution; solid waste management; analysis of environmental problems and development of engineering solutions. **Prerequisite**: CHEM 211. Annually.		

CIVE 435	Hydraulics	3(3,0)
Engineering approaches to the measurement control and conveyance of water flows with particular emphasis on the analysis, design, characteristics, and selection of hydraulic models, and design of water and wastewater systems. **Prerequisite**: MECH 333. Annually.		

CIVE 499	Co-op Work Experience	1(0, 0)
This Co-op work experience is designed to provide students with an eight-week short-term work experience in the field of Civil and Environmental Engineering. Students will be aligned with discipline-related industries, institutions of higher learning, or government agencies. **Prerequisite**s: ENGL 217; Senior Standing.		

CIVE 501	Construction Planning and Management	3(3,0)
Fundamental elements of management of civil engineering projects; roles of all participants in the process: owners, designers, contractors, and suppliers; emphasis on contractual aspect, project estimate, planning and control of construction projects; management functions, network techniques (CPM), resource scheduling, construction financing and cost/schedule relationship. **Prerequisite**: Senior standing. Annually.		

CIVE 507	Structural Analysis II	3(3,0)
Statically indeterminate structures, force method (beams, trusses, and frames). Cable supported indeterminate structures. Temperature and settlement effects. Displacement methods: slope-deflection equations and moment distribution (beams and rigid frames). Qualitative influence lines for statically indeterminate beams. **Prerequisite**: CIVE 312. Annually.		

CIVE 536	Hydrology	3(3,0)
Measurement and analysis of precipitation data, flood analysis, methods of estimation of evaporation and transpiration, streamflow measurement, groundwater hydrology, groundwater reservoirs, ground-water discharge, rainfall runoff relationship, statistical analysis in hydrology. **Prerequisite**: CIVE 435. Annually.		

CIVE 538	Water and Wastewater Treatment	3(3,0)
Quality and control tests of water and wastewater, design principles of water and wastewater treatment plants, physical, chemical, and biological operation processes. **Prerequisite**: CIVE 432, CIVE 435. Annually.		

CIVE 595 A	BE Summative Learning Project 1	1(1,0)
Team-oriented project which includes conducting and formulating experimental laboratory work and/or design problems on a specific approved topic of specialty. The project includes literature review and scope of work as well as project proposal. **Prerequisite**s: Senior Standing, ENGL 217. Annually.		

CIVE 595 B	BE Summative Learning Project 2	2(2,0)
Team-oriented project which includes conducting and formulating experimental laboratory work and/or design problems on a specific approved topic of specialty. The project includes literature review, design work, data collection, experimentation, data analysis and technical writing. **Prerequisite**: CIVE 595A. Annually.		

II. Elective Courses

Students may satisfy their technical electives requirements by selecting from the following set of courses.

1. Common Courses and Construction Management Sequence

CIVE 502	Engineering Risk Analysis	3(3,0)
Elements of set theory, basic elements of probability theory, random variables, multiple random variables, function of random variables, probabilistic models, statistical inference, and formulation of the reliability problem. **Prerequisite:** MATH 351.		

CIVE 503	Computer Methods in Civil Engineering	3(3,0)
Using the computer for analysis, design, and decision making in civil engineering. Conversion of CAD or REVIT elements to structural elements. Shop drawings. Value engineering. Applications. **Prerequisite:** Senior Standing.		

CIVE 504	Infrastructure Asset Management	3(3,0)
Problems of infrastructure, asset management principles, methods of inspection and monitoring of civil infrastructures, risk assessment, asset condition information and data, and replace/maintain decision. **Prerequisite:** Senior Standing.		

CIVE 506	LEED and Green Construction Principles in Construction Management	3(3,0)
Green construction methods and benefits in applying the Leadership in Energy and Environmental Design (LEED) principles. **Prerequisite:** Senior Standing.		

CIVE 597	Topics in Civil Engineering	3(3,0)
This course covers topics of special interest in Civil Engineering. These topics may vary each time the course is offered, and the content of the course will be available with the course offering. May be repeated for credit as topics vary. **Prerequisite:** Consent of Advisor.		

2. Structural Analysis & Design Sequence

CIVE 510	Finite Elements Analysis	3(3,0)
Theory of the finite element method; spring, truss, and beam elements; constant strain elements; plane stress or strain for axisymmetric problems; plates and shells; introduction to non-linear material analysis; introduction to structural dynamic analysis; applications. **Prerequisite**: CIVE 312. On demand.		

CIVE 511	Structural Dynamics	3(3,0)
Dynamic response of single, and multi-degree of freedom systems; modal analysis of lumped; continuous mass systems; Natural frequencies and modes shapes, deterministic time domain approach and design response spectra; seismic response of structures; peak response; seismic design principles. **Prerequisite**: CIVE 312. On demand.		

CIVE 512	Advanced Structural Analysis	3(3,0)
Flexibility and Stiffness matrix methods for analysis of indeterminate trusses, beams, and frames. Grid beams and structures on elastic supports. Composite Structural systems. Influence lines of indeterminate structure utilizing concepts of virtual work and moment distribution methods – Qualitative and Quantitative approaches. **Prerequisite**: CIVE 507. On demand.		

CIVE 514	Earthquake Engineering	3(3,0)
Earthquake causes and measures, earthquake faults and waves, plate tectonics, structural dynamics of single and multi-degree of freedom systems, seismic hazard evaluation in engineering practice, response analysis of structures. Equivalent static lateral force method, lateral loads resistive systems, architectural consideration for earthquakes, mitigation of earthquake forces. **Prerequisite**: CIVE 312. On demand.		

CIVE 515	Prestressed Concrete	3(3,0)
Definitions and Methods of prestressing. Materials and their properties. Discussion of losses in prestressing. Elastic behavior stress distribution under different load stages. Analysis and design of homogeneous sections. Shear cracking load. Behavior of beam. Load Balancing Procedures. Deflection. Stresses resulting from shrinkage and creep. Partial prestressing. **Prerequisite**: CIVE 415. On demand.		

CIVE 519	Tall Building Structures	3(3,0)
Loadings; structural systems and analysis modeling; braced frames; rigid frames structures, stability of high-rise buildings, dynamic response, shear wall structures, coupled shear wall structures, wall-frames Dual structural systems. **Prerequisite**: CIVE 413. On demand.		

3. Construction Material and Geotechnics Sequence

CIVE 521	Special Concretes	3(3,0)
Design and characteristics of lightweight concrete, heavyweight concrete, self-consolidating concrete, fiber-reinforced concrete, mass concrete; concrete in hot weather, concrete in cold weather, high strength concrete, high performance concrete, roller compacted concrete and shrinkage compensating concrete. **Prerequisite**: CIVE 321. On demand.		

CIVE 522	Durability of Construction Materials	3(3,0)
Definition and importance of durability; properties of main building materials (concrete, ferrous and non-ferrous metals, wood, building stones, clay bricks, gypsum, lime, plastics); factors affecting durability; mechanisms of decaying; precautions to		

increase durability; selection of durable material; tests for durability; economic aspects and impact of durability. **Prerequisite**: CIVE 321. On demand.

CIVE 523	**Repair of Concrete Structures**	**3(3,0)**
Conventional methods of investigation, nondestructive methods, structural health monitoring, corrosion risk evaluation, protection of reinforcing steel against corrosion, instrumentation techniques, repair materials and techniques, removal, and preparation of concrete for repair, crack repair, concrete patching, structure strengthening, case studies. **Prerequisite**: CIVE 321. On demand.		

CIVE 524	**Nondestructive Evaluation & Instrumentation of Infrastructure**	**3(3,0)**
Overview on the different types of civil infrastructure, their problems and durability, use of nondestructive evaluation methods to assess their actual conditions, basic NDE methods, sonic and ultrasonic methods, ground penetrating radar (GPR), infrared thermography, electrical resistivity, radioactive and nuclear methods, sensing technologies, different instruments/sensors and their use, wireless technology, structural health monitoring. Case studies and laboratory demonstrations. **Prerequisite**: CIVE 321. On demand.		

CIVE 525	**Concrete Technology**	**3(3,0)**
Cement and supplementary cementitious materials, mechanical behavior of concrete, properties and applications of various specialized concretes, hot weather concreting, cold weather concreting, chemical admixtures, concrete mix proportioning, deterioration mechanisms, environmental and physical causes of degradation, alkali-aggregate reaction, carbonation, chloride attack, sulfate attack, acid and seawater attack, freeze-thaw cycle. **Prerequisite**: CIVE 321. Annually.		

CIVE 526	**Admixtures for Concrete**	**3(3,0)**
Definition and classification of concrete admixtures; precautions in their use; chemical admixtures; mineral admixtures; miscellaneous admixtures; type and properties of admixtures; standard specifications; classification and purpose of use; beneficial and detrimental effects on the properties of fresh and hardened concrete; mechanism of action; advantages and disadvantages**. Prerequisite**: CIVE 321. On demand.		

CIVE 527	**Seepage and Dams**	**3(3,0)**
Measurement of hydraulic conductivity (permeability), analysis of seepage using analytical solutions, graphical procedures, and numerical methods; control of seepage; wells, filters, and drains; types of dams; performance of earth and earth-rock dams. **Prerequisite**: CIVE 424; Co-requisite: CIVE 536. On demand.		

CIVE 528	**Earth Retaining Structures**	**3(3,0)**
Types of earth retaining systems; earth pressure theory; design of externally stabilized walls; Design of internally stabilized walls; Reinforcing elements; fundamentals of soil-reinforcement interaction. **Prerequisite**: CIVE 424, CIVE 314. On demand.		

CIVE 529	Advanced Foundation Engineering	3(3,0)
Lateral earth pressure, retaining walls, sheet pile walls, anchors, braced cuts, drilled shaft foundations, foundations on collapsible soils, foundations on expansive soils, foundations on rock, soil improvements methods. **Prerequisite**: CIVE 424. On demand.		

4. Water and Environmental Engineering Sequence

CIVE 571	Water Quality	3(3,0)
Water quality parameters, sources of drinking water, drinking water problems and impact on human life, drinking water treatment methods, common operations in water treatment plants, design of distribution systems, assessment and monitoring of water quality. **Prerequisite**: CIVE 432. On demand.		

CIVE 573	Solid Waste Management	3(3,0)
Study of types and sources of non-hazardous municipal solid wastes, estimating quantity and storage volumes of wastes, identify collection, transfer, treatment and disposal alternatives, preliminary design of landfills, solid waste management principles and processes, and pollution control management. **Prerequisite**: CIVE 432. On demand.		

CIVE 575	Water Supply & Wastewater Systems	3(3,0)
Identification and evaluation of water supply solutions; design of water distribution networks; pumping; population forecasting and requirements; collecting and disposing of stormwater and sewage; design of storm and sewage systems; excess stormwater management, environmental risk and protection measures. **Prerequisite**: CIVE 435. On demand.		

CIVE 576	Hydraulic Structures	3(3,0)
Hydraulic aspects of the theory and design of hydraulic structures, types of dams and their function, stability analysis of gravity dams, culverts, navigation canals, reservoirs and port facilities, control structures such as gates and weirs. **Prerequisite**: CIVE 435 and CIVE 536. On demand.		

5. Public Works Sequence

CIVE 540	GIS for Civil Engineering	3(3,0)
Review of basic cartographic principles and the use of geographic information systems for thematic mapping, spatial analysis, and application in the water resources sector. Laboratory emphasizes experience with GIS software. **Prerequisite**: Senior Standing. On demand.		

CIVE 541	Pavement Design	3(3,0)
Analysis and design of flexible and rigid pavements; pavement type selection; loading; failure criteria and reliability; mechanistic pavement design; design exercises using existing methods. **Prerequisite**: CIVE 423. On demand.		

ELECTRICAL AND COMPUTER ENGINEERING DEPARTMENT (ECE)

Faculty Members

Chairperson:	Rached Zantout
Professors:	Mohamad Diab, Mohamad Taha, Rached Zantout, Toufic Hijazi
Associate Professors:	Maher Sabbah
Instructor:	Amal Arid, Milana Kassab
Adjunct Faculty:	Firas Abdallah, Mohamad Alwan, Ousama Mustafa

Vision

The Electrical and Computer Engineering Department (ECE) envisages being a leader in shaping intellectual and human capital in electrical, computer, communication, and biomedical engineering. The department seeks to produce experienced graduates in all fields of electrical, computer, communication, and biomedical engineering who are application oriented. Our graduates are trained so as to enrich Lebanon, the Middle East and the world in general technologically, economically, and socially.

Mission

The mission of the department is to be recognized as one of the best departments of electrical and computer engineering. Such excellence is not restricted to education only but should also encompass research, especially in transferring research outcomes to the community at large.

Programs Offered

The ECE Department offers three programs – Electrical Engineering, Computer and Communications Engineering and Biomedical Engineering. Each program grants three degrees: Bachelor of Science, Bachelor of Engineering and Master of Science.

ELECTRICAL ENGINEERING PROGRAM

Mission

The Electrical Engineering program at RHU aims to help students explore their innate creativity and potential and endow them with the knowledge, skills and abilities to: pursue successful careers in electrical engineering and related fields; think critically in solving complex problems using modern tools and technologies; communicate and work effectively with diverse groups; learn more every day, and succeed in graduate studies in renowned institutions if they so choose.

Objectives

The program educational objectives are to enable students to:

1. Foster an environment that encourages excellence in endeavor.
2. Provide quality and professional education which prepares leaders.
3. Solve problems facing the society and industry in Lebanon, the Middle East, and the world.
4. Engage in multidisciplinary research.

Program Learning Outcomes

The Electrical Engineering program adopts the learning outcomes of ABET so our graduates will have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Accreditation

The Bachelor of Engineering program in Electrical Engineering has been accredited by the Engineering Accreditation Commission (EAC) of **ABET**, 415 North Charles Street, Baltimore, MD 21201; www.abet.org.

Career Opportunities

An Electrical engineer could develop components for some of the most fun things in our lives (MP3 players, digital cameras, or roller coasters) as well as the most essential (medical tests or communications systems). This largest field of engineering encompasses the macro (huge power grids that light up cities, for example) as well as the micro (including a device smaller than a millimeter that tells a car's airbags when to inflate). An electrical engineer may work in the areas of robotics, computer networks, electric transportation systems, medical imaging, or renewable energy systems —areas that are at the very forefront of technological innovation - as well as in the low power industry and power plants.

Program Overview

The Electrical (ELEC) Engineering Program at Rafik Hariri University puts what is in the best interest of students, first and foremost. Every little experience the student attains represents a block in the building of a competent, confident, purposeful, problem solving, competitive, responsible, and conscientious individual. This is accomplished by means of a curriculum and facilities that conform to the highest of standards, faculty members committed to the academic and personal growth of the student, and an environment that inspires learning and drives creativity.

The Bachelor of Engineering (BE) program in Electrical Engineering encompasses 147 credit hours spread over eight regular semesters and three summer semesters. The Bachelor of Science (BS) program comprises a total of 114 credit hours spread over six regular semesters and three summer semesters. In addition to completing the credits requirements, a BS or a BE degree is conferred upon a student if the earned Cumulative GPA, Major PGA and the Summative Learning Project grade are all 70 or above.

The required credit hours span three categories: General Education requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours for the BS and the BE programs is shown in the following tables:

BS in Electrical Engineering (114 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education Requirement	0	0	21	6	27	24
College Requirement	0	0	22	3	25	22
Program Requirement	40	0	22	0	62	54
Credits	40	0	65	9	114	100

BE in Electrical Engineering (147 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	0	0	21	9	30	20
College Requirement	0	0	25	3	28	19
Program Requirement	50	15	24	0	89	61
Credits	50	15	70	12	147	100

I. General Education Requirements

The list of the GE required courses and their descriptions are presented in the introductory pages of the College of Engineering section in this catalog.

II. College Requirements

The list of the College required courses and their descriptions are presented on the introductory pages of the College of Engineering section in this catalog.

III. Program Requirements

The program requirements for a Bachelor of Engineering degree in Electrical Engineering encompass 89 credits (62 credits for the BS degree) distributed as follows: 70 credits (62 credits for the BS degree) Mandatory courses and 15 credits engineering technical elective courses for BE only.

A. Mandatory requirements

The major and non-major ELEC program mandatory courses are listed in the table below.

Course #	Title	Credits	Prerequisites
CCEE 221 + 221L	Logic Design and Lab	4	
CCEE 331	Signals and Systems	3	MATH 211
CCEE 341	Communication Systems	3	CCEE 331

CCEE 426 + 426L	Design of Embedded Systems and Lab	4	CCEE 221
CCEE 534	Signal Processing	2	CCEE 331
ELEC 200	Introduction to Electrical and Computer Engineering	3	
ELEC 301 + 301L	Sensors and Sensor Circuit Design and Lab	4	
ELEC 320 + 320L	Electronics and Lab	4	ELEC 210
ELEC 330	Power Systems	3	ELEC 210
ELEC 331 + 331L	Electric Machines and Lab	4	ELEC 210
ELEC 340	Engineering Electromagnetics	3	PHYS 211
ELEC 341 + 341L	Measurements and Instrumentation and Lab	3	ELEC 320
ELEC 405	Electrical System Design	3	ELEC 210
ELEC 423	Electronics Circuit Design	3	ELEC 301, Co-req.: ELEC 320
ELEC 431	Introduction to Renewable Energy Systems	3	ELEC 210
ELEC 432 + 432L	Power Electronics and Lab	4	ELEC 320
ELEC 451	Control Systems	3	CCEE 331
ELEC 499	Co-op Work Experience	1	ENGL 217
ELEC 533	Advanced Machines and Drives	3	ELEC 331, 432
ELEC 534	Advanced Power Systems	3	ELEC 330
ELEC 563	Smart Grid Technology	3	ELEC 432
ELEC 595A	BE Summative Learning Project 1	1	ENGL 217
ELEC 595B	BE Summative Learning Project 2	2	ELEC 595A
MECH 333	Thermal Fluid Sciences	3	MATH 211

* Required of BS bound students. BE students take technical elective instead.

B. Technical Electives

As part of the program for the Bachelor of Engineering in ELEC Engineering, the student is required to study 15 credit hours of engineering technical elective courses. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. The student can also mix and match elective courses from the different areas to get a more general exposure to the different ELEC Engineering disciplines. The student should select, in cooperation with the academic advisor, the list of electives that best meet his or her needs and aspirations. The listed engineering technical elective courses and other courses from other engineering programs, in addition to the required program courses, are designed to allow the student to develop in-depth knowledge and understanding in the following areas: (1) Power, (2) Renewable Energy, (3) intelligent systems.

It is highly recommended that the student takes elective courses from the list below after completing the mandatory requirements in the related area. Students may select

technical electives from other programs subject to approval of the academic advisor and the corresponding course instructor.

Course #	Title	Credits	Prerequisites
ELEC 406	Modeling and Simulation	3	PHYS 211 and ELEC 210
ELEC 433	High Voltage Engineering	3	ELEC 330
ELEC 434	Electrical Power Distribution	3	ELEC 330
ELEC 444	Electromagnetic Compatibility	3	ELEC 210
ELEC 498	Special Topics in Electrical Engineering	3	Instructor's consent
ELEC 503	Artificial Neural Systems	3	
ELEC 504	Lasers and Laser Applications in Engineering	3	
ELEC 531	Electrical Power Systems for Transportation Applications	3	Co-req.: ELEC 432 Senior Standing
ELEC 532	Application of Power Electronics in Power Systems	3	ELEC 330, ELEC 432
ELEC 536	Renewable Energy Systems	3	ELEC 431
ELEC 542	Advanced Power Electronics	3	ELEC 432
ELEC 551	Nonlinear Adaptive Control	3	ELEC 451
ELEC 560	Sustainable Energy	3	None
ELEC 561	Wind Energy Technology	3	ELEC 431 and ELEC 432
ELEC 562	Solar Energy Technology	3	ELEC 210
ELEC 563	Smart Grid Technology	3	None
ELEC 597	Advanced Topics in Electrical Engineering		Senior Standing

C. Summative Learning Project

Students must complete a 3- credit hours course for BS (3-credits for BE; taken 1 credit in the first regular semester and 2 credits in the following regular semester) in which they work, preferably in groups, on a problem of concern to industry or the community at large, or to innovate a promising idea. The SLP could be an extension of the projects students had worked on in previous courses to bring it to a more useful outcome.

D. Co-op Experience

Students must complete 8 weeks of practical training in working in an area related to their field of interest. The Co-op experience is usually fulfilled during the summer semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on student's progress throughout the Co-op period by conducting field visits and ensuring that student's performance is aligned with their aspirations and employers' needs. Students are required to submit a formal report, a poster and make a formal presentation about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to stipulate additional conditions.

Course Coding

The courses offered in the ELEC Engineering program are designated code numbers in the form of (ELEC abc) where:

a:	Designates course year/level
b:	Designates focus area as follows: 0: General; 1: Electrical; 2: Electronics; 3: Power; 4: Magnetism; 5: Control
c:	Designates course sequence in area

For example, ELEC 320 is the *first course* in the area of *Electronics* offered by the *electrical engineering program* in the *second year*.

Study Plan

The following study plan summarizes the courses and credits distribution for the Bachelor of Science (BS) and Bachelor of Engineering (BE) in ELEC Engineering. The study plan serves as a roadmap to facilitate student's smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Fall Semester (16 Credits)			
CCEE 214	Introduction to Programming	3	
ENGL 210	English Composition and Rhetoric	3	Placement
ELEC 200	Introduction to Electrical & Computer Engineering	3	
MATH 211	Calculus III	4	
PHYS 211	Physics: Electricity and Magnetism & Lab	3	
Year 1, Spring Semester (15 Credits)			
CCEE 221	Logic Design	3	
ELEC 210	Electric Circuits	3	PHYS 191 or Equivalent
MATH 311	Linear Algebra and Applications	3	
MECH 333	Thermal Fluid Sciences	3	MATH 211
	Science Elective I	3	
Year 1, Summer Semester (10 Credits)			
CCEE 221L	Logic Design Lab	1	Co-req.: CCEE 221
MATH 351	Probability and Statistics	3	MATH 211
PHYS 312	Modern Physics	3	
	Social Science Elective	3	
Year 2, Fall Semester (17 Credits)			
CCEE 331	Signals and Systems	3	MATH 211
ELEC 301	Sensors and Sensor Circuit Design	3	
ELEC 301L	Sensors and Sensor Circuit Design Lab	1	Co-req.: ELEC 301
ELEC 320	Electronics	3	ELEC 210
ELEC 320L	Electronics Lab	1	Co-req.: ELEC 320

ENGL 217	Professional English	3	ENGL 210
MATH 314	Ordinary Differential Equations	3	MATH 211
Year 2, Spring Semester (17 Credits)			
CCEE 341	Communication Systems	3	CCEE 331
ELEC 330	Power Systems	3	ELEC 210
ELEC 331	Electric Machines	3	ELEC 210
ELEC 331L	Electric Machines Lab	1	Co-req.: ELEC 331
ELEC 340	Engineering Electromagnetics	3	PHYS 211
ELEC 341	Measurements and Instrumentation	3	ELEC 320
ELEC 341L	Measurements and Instrumentation Lab	1	Co-req.: ELEC 341
Year 2, Summer Semester (6 Credits)			
ENGR 300	Engineering Economics and Management	3	
MATH 210 / MATH 421	Discrete Math/Numerical Analysis	3	MATH 311
Year 3, Fall Semester (16 Credits)			
ARAB 212	Arabic Language and Communication	2	
CCEE 426	Design of Embedded Systems	3	CCEE 221
CCEE 426L	Design of Embedded Systems Lab	1	Co-req.: CCEE 426
CMNS 200	Etiquette	1	Co-req.: ENGL 210
ELEC 423	Electronics Circuit Design	3	ELEC 301; Co-req.: ELEC 320
ELEC 451	Control Systems	3	CCEE 331
	Humanities Elective	3	
Year 3, Spring Semester (16 Credits)			
ELEC 405	Electrical System Design	3	ELEC 210
ELEC 431	Introduction to Renewable Energy Systems	3	ELEC 210
ELEC 432	Power Electronics	3	ELEC 320
ELEC 432L	Power Electronics Lab	1	Co-req.: ELEC 432
ELEC	Engineering Technical Elective 1*	3	
	Science Elective II	3	
Year 3, Summer Semester (1 Credit)			
ELEC 499	Co-op Work Experience	1	ENGL 217
The above 114 credits complete the requirements for a Bachelor of Science degree in Electrical Engineering.			
Year 4, Fall Semester (16 Credits)			
CCEE 534	Signal Processing	3	CCEE 331
ELEC 534	Advanced Power Systems	3	ELEC 330
ELEC 595A	BE Summative Learning Project 1	1	ENGL 217, Senior standing
ENGR 510	Engineering Project Management	3	ENGR 300
	Engineering Technical Elective 2	3	
	Engineering Technical Elective 3	3	
Year 4, Spring Semester (17 Credits)			

ELEC 533	Advanced Machines and Drives	3	ELEC 331, 432
ELEC 563	Smart Grid Technology	3	ELEC 432
ELEC 595B	BE Summative Learning Project 2	2	ELEC 595A
	Engineering Technical Elective 4	3	
	Engineering Technical Elective 5	3	
	Social Sciences/ Humanities Elective II	3	
Total BE credits: 147			

* BS bound students are required to take ELEC 400 – Summative Learning (BS) Project instead.
Note: Engineering Technical Electives (levels 400 or above) are selected as such:
6 credits restricted Departmental Electives
9 credits from any Engineering discipline of levels 400 or above.

Courses Description

I. Mandatory Courses

Non-Major Courses

Description of the mandatory, non-major courses follow.

CCEE 214	**Introduction to Programming**	**3(2,2)**
This course presents the fundamentals of structured programming concepts. It covers primitive data types, expressions, control statements, functions, arrays, basic searching/sorting algorithms, and introduction to pointers. **Prerequisite**: None. Equivalent to COSC 214.		

CCEE 221	**Logic Design**	**3(3,0)**
This course addresses Boolean algebra and logic simplification techniques, data representation, and the design of combinational logic networks for decoders, encoders, multiplexers, and demultiplexers. Design of sequential logic devices including flip-flops, registers, and counters, as well as analysis of devices used to build logic networks, including programmable logic devices. Equivalent to COSC 351.		

CCEE 221L	**Logic Design Lab**	**1(0,2)**
This Lab covers design techniques and implementation of combinational and sequential logic circuits. Experiments include logic gates, design and implementation of logic circuits, combinational logic circuits (decoders, encoders, multiplexers, demultiplexers and adders), and design of sequential logic devices using flip-flops, registers, and counters. **Prerequisite**: CCEE 221. **Prerequisite**: CCEE 221. Equivalent to COSC 351L.		

CCEE 331	**Signals and Systems**	**3(3,0)**
This course covers mathematical description and classification of continuous and discrete signals and systems. Topics include types of signals and systems, Fourier series, Fourier transforms, Discrete-Time Fourier transforms (DTFT), Discrete and Fast		

Fourier Transforms (DFT and FFT), Laplace transforms, z-transforms, transfer functions. **Prerequisite:** MATH 211

CCEE 341	**Communication Systems**	**3(3,0)**
This course introduces the fundamentals of transmission and reception in communication systems and the effect of noise. Topics include power spectral density, amplitude modulation and demodulation, angle modulation and demodulation, analog communication system performance in the presence of noise, sampling and analog-to-digital conversion, introduction to digital modulations, channel capacity. **Prerequisite**: CCEE 331.		

CCEE 426	**Design of Embedded Systems**	**3(3,0)**
This course addresses the design of embedded real-time systems, models of computation, validation techniques, and automatic synthesis. Finite state machines, synchronous languages, data flow networks, petri nets, software optimization and performance estimation, operating systems and scheduling, system-level simulation, and interface-based design. **Prerequisite**: CCEE 221. Equivalent to COSC 356.		

CCEE 426L	**Design of Embedded Systems Lab**	**1(0,2)**
This lab complements topics covered in the CCEE 426 course. It involves design of embedded real-time systems, models of computation, validation techniques, and automatic synthesis. Experiments include design using finite state machines, synchronous languages, data flow networks, petri nets, software optimization and performance estimation, scheduling, system-level simulation, and interface-based design. **Co-requisite**: CCEE 426. Equivalent to COSC 356L.		

CCEE 534	**Signal Processing**	**3(3,0)**
This course covers time series analysis, frequency analysis, time-frequency and time-scale analysis. It also covers the design of digital filters and signal modeling. **Prerequisite**: CCEE 331.		

ELEC 301	**Sensors and Sensor Circuit Design**	**3(3,0)**
This course provides an introductory overview of the multidisciplinary field of sensors. The student is first introduced to the fundamental concepts of signals and noise in measurement, characteristics of the measurement system and determination of absolute quantity. Then the student learns about the different types of sensors to measure pressure, force, flow, motion and temperature.		

ELEC 301L	**Sensors and Sensor Circuit Design Lab**	**1(0,2)**
The lab teaches students how to measure and interpret different types of signals. Experiments include signal, noise, pressure (strain gauge) and temperature measurements; flow, motion, and force measurements; and applications using research and simulation kits. **Co-requisite**: BIOM 301.		

ELEC 423	Electronics Circuit Design	3(3,0)
This course offers students a methodology of the design process with emphasis on the feasibility and preliminary design phases such as conditioning circuit, Op-amp and feed-back systems, filters, oscillators, sample/hold, DAC/ADC, Data acquisition Boards. Students will learn how to write proposals and reports as well as increasing their creativity through group projects from industry with inter-disciplinary topics. **Prerequisite**: ELEC 301, **Co-requisite**: ELEC 320.		

ENGL 210	English Composition and Rhetoric	3(3,0)
This course reviews the fundamentals of good academic writing in English, teaches essay writing essentials and research skills in two rhetorical modes (persuasion and argumentation), and provides practice in writing essays in these modes, research paper, and oral presentation. **Prerequisite:** ENGL 101 or TOEFL 550+ (paper) or 80+ (computer).		

ENGL 217	Professional English Communication	3(3,0)
This is a required course designed to help students develop effective professional communication skills, both orally and in writing. In this course, students learn how to write emails, memos, letters, proposals, reports, and other forms of employment correspondence. In addition, this course helps students sharpen their presentation skills. Broadly, this course enables students to behave professionally and effectively in their prospective jobs. **Prerequisite**: ENGL 210.		

ENGR 300	Engineering Economics and Management	3(3,0)
Concepts and techniques in basic Engineering economy principles and applications. Interest and financial mathematics; present worth, annual worth, benefit/cost ratio, internal rate of return, multiple alternatives, income tax, inflation, Risk analysis, Investment and investment choice, equivalence, loans, cost of capital, retirement and replacement, sector analysis and viewpoint, sensitivity analysis, accounting, and financial statements. .		

ENGR 510	Engineering Project Management	3(3,0)
The course covers key components of engineering project management including projects election and planning, project time management, cost estimation and pricing, contract and specifications, quality management, engineering ethics and professional conduct, realizing impact of engineering solutions in various contexts (global, economic, environmental, societal, etc...), sustainability in engineering designs, human resources consideration, communications, risk management, and procurement management. **Prerequisite:** ENGR 300.		

MATH 210	Discrete Mathematics	3(3,0)
Logic, propositional equivalences, predicates and quantifiers, methods of proof, proof strategy, mathematical induction, recursive definitions, and structural induction, sets and set operations, functions, growth of functions, basics of counting, permutations and combinations, Binomial theorem, relations and their properties, representing relations, equivalence relations, introduction to graphs, graph terminology, introduction to trees.		

MATH 211	Calculus III	4(4,0)
Hyperbolic functions and their inverses, infinite sequences and series, polar coordinates, cylinders and quadric surfaces, functions of several variables, partial derivatives, Multiple integrals in rectangular, cylindrical, and spherical coordinates, substitutions.		

MATH 311	Linear Algebra with Applications	3(3,0)
Systems of linear equations, matrix algebra, linear transformations, determinants, vector spaces, eigenvalues and eigenvectors, symmetric matrices, orthogonality, diagonalization.		

MATH 314	Ordinary Differential Equations	3(3,0)
First order linear differential equations, linear differential equations of second and higher order, linear differential equations with variable coefficients, series solutions, Legendre's and Bessel's equations, systems of differential equations, Laplace transforms and their inverses. **Prerequisite:** MATH 211.		

MATH 351	Probability and Statistics	3(3,0)
Probability and conditional probability, Discrete and continuous random variables, marginal distributions, expectation, variance-mean-median-covariance and correlation, conditional expectation, binomial, multinomial and Poisson distributions, Normal distribution, Sampling distribution, Prediction and confidence intervals, Hypothesis testing. **Prerequisite**: MATH 211.		

MATH 421	Numerical Analysis	3(3,0)
Error Analysis, solutions of nonlinear equations using fixed point- Newton-Raphson-Muller's methods, solution of linear system using Gaussian elimination-iterative methods, interpolation and approximation using Taylor series-Lagrange approximation-Newton polynomials, numerical differentiation and integration, numerical optimization, solutions of ordinary and partial differential equations using Euler's and Heun's and Rung-Kutta methods. **Prerequisite**: MATH 311.		

MECA 341	Measurements and Instrumentation	3(3,0)
This course covers the fundamentals of instrumentation and measurement of various physical quantities. Topics include sensor types, technologies, characteristics and calibration; design of a measurement system; statistical analysis of measured data; measurement noise and uncertainties; data acquisition, data storage and display devices; signal conditioning and interface electronics concepts including filtering, A/D and D/A conversion, amplification, modulation, compensation; applications; **Prerequisite**: ELEC 320, Annually.		

MECA 341L	Measurements and Instrumentation Lab	1(0,2)
The lab experience complements the topics covered in MECA 341. Students learn to use the NI ELVIS platform, LabVIEW programing and data acquisition systems characteristics to build a measurement system, perform data analysis and senor calibration, and design and build signal conditioning circuits for various types of		

measurements. The lab involves a team project to integrate all instrumentation and measurement tools and techniques are applied to build a measurement system and submit a report. **Co-requisite**: MECA 341.

MECH 333	**Thermal Fluid Sciences**	**3(3,0)**
This course seeks to impart thermal-fluid fundamental concepts (including Thermodynamics, Fluid Mechanics, and Heat Transfer) to non-mechanical engineering students. These covers: thermodynamic state and properties of pure substances; concepts of work and heat, energy analysis of closed systems (First Law) and simple flow devices, Fluid statics; Bernoulli's equation; Conservation of mass, momentum & energy, viscous flow in pipes, introduction to conduction, convection and radiation heat transfer. **Prerequisite**: MATH 211. Annually.		

PHYS 211	**Physics: Electricity and Magnetism and Lab**	**3(3,1)**
This course covers fundamental topics in Electricity and Magnetism: Electric forces and Electric Fields for discrete and continuous charge distribution, Gauss's Law, Electric Potential, Capacitance and Dielectrics, Kirchhoff's rules, Magnetic Fields and Forces, Biot-Savart Law, Ampere's Law, Magnetic Flux and Gauss's Law in Magnetism. It also includes a laboratory component that introduces students to the "real world" by offering a set of experiments in electricity and magnetism. **Prerequisite**: None.		

PHYS 312	**Modern Physics**	**3(3,0)**
This course introduces the principles of revolutionary developments of the 20th century. It covers interaction of light and matter (Photoelectric effect, Compton, Auger, etc.), the dual nature of light, various models of atomic description, quantum numbers, relativistic approach, Heisenberg Uncertainty Principle, Schrodinger Equation, and an introduction to the band theory of solids and to particle physics.		

Major Courses

Mandatory electrical engineering courses are described below.

ELEC 200	**Introduction to Electrical and Computer Engineering**	**3(3,0)**
In this course the student will be trained in core skills to equip them to excel in electrical, biomedical and computer and communications engineering. The student will be trained in application programming using an appropriate programming environment. Students will build on the basics of Programming learned in the introductory programming course to implement Digital Signal Processing applications and perform data analysis. Students will also be introduced to basic lab equipment such as Oscilloscopes, Function Generators, Multi-Meters. Students will be introduced to microcontrollers-based projects to explore more of the Electrical and Computer Engineering majors (CCE, BIOM and ELEC major). Throughout the course, students will be working in multidisciplinary teams to study cases of Engineering for the community as well as implement a project to answer a need in the community.		

ELEC 210	Electric Circuits	3(3,0)
This course covers circuit elements and laws, mesh and node equations, network theorems, energy storage elements, RC, RL, and RLC circuits, transformers, sinusoidal (AC) steady state analysis, power calculation, and introduction to three phase circuit. **Prerequisite**: PHYS 191 or Equivalent.		

ELEC 301	Sensors and Sensor Circuit Design	3(3,0)
This course provides an introductory overview of the multidisciplinary field of sensors. It includes interpreting relevant signals; measurement of noise, pressure, flow, motion and force; and electrode theory.		

ELEC 301L	Sensors and Sensor Circuit Design Lab	1(0,2)
The lab teaches students how to measure and interpret signals. Experiments include signal, noise, pressure (strain gauge) and temperature measurements; fluids and gases flow, motion, and force measurements; and applications using electrodes based on medical equipment and research and simulation kits. **Co-requisite**: ELEC 301.		

ELEC 320	Electronics	3(3,0)
This course covers semiconductors, PN junctions, diode theory and circuits, bipolar junction transistors, transistor fundamentals, transistor biasing, amplifiers, MOSFETs, and operational amplifiers. **Prerequisite:** ELEC 210.		

ELEC 320L	Electronics Lab	1(0,2)
This is a Lab course with experiments in Electrical and Electronic Circuits. It covers passive electrical elements and sources; lab instruments; voltage divider circuits; Thevenin's theorem; RC circuits; diode circuits; Op-Amp circuits; BJT and MOSFET characteristics. **Co-requisite:** ELEC 320.		

ELEC 330	Power Systems	3(3,0)
This course covers three-phase power systems, symmetrical components, transmission lines, power transformers, power systems modeling, per unit analysis, power flow studies and fault analysis. **Prerequisite:** ELEC 210.		

ELEC 331	Electric Machines	3(3,0)
This course covers magnetic circuits, fundamentals of electromechanical energy conversion, construction, testing, steady-state analysis, and operational characteristics of DC machines, transformers, induction machines and synchronous machines. **Prerequisite**: ELEC 210.		

ELEC 331L	Electric Machines Lab	1(0,2)
This is a Lab course with experiments on electric machines. It covers the following topics: basics of DC motors and generators, DC series, shunt and separately excited motors and generators, single phase AC induction machines and 3-phase machines. **Co-requisite:** ELEC 331.		

ELEC 340	Engineering Electromagnetics	3(3,0)
This course covers vector analysis, static electric fields, static magnetic fields, time varying fields and Maxwell's equations and electromagnetic waves. **Prerequisite:** PHYS 211.		

ELEC 341	Measurements and Instrumentation	3(3,0)
This course covers the fundamentals of instrumentation and measurement of various physical quantities. Topics include sensor types, technologies, characteristics and calibration; design of a measurement system; statistical analysis of measured data; measurement noise and uncertainties; data acquisition, data storage and display devices; signal conditioning and interface electronics concepts including filtering, A/D and D/A conversion, amplification, modulation, compensation; applications; **Prerequisite**: ELEC 320, Annually.		

ELEC 341L	Measurements and Instrumentation Lab	1(0,2)
The lab experience complements the topics covered in MECA 341. Students learn to use the NI ELVIS platform, LabVIEW programing and data acquisition systems characteristics to build a measurement system, perform data analysis and senor calibration, and design and build signal conditioning circuits for various types of measurements. The lab involves a team project to integrate all instrumentation and measurement tools and techniques are applied to build a measurement system and submit a report. **Co-requisite**: ELEC 341.		

ELEC 400	Summative Learning (BS) Project	3(3,0)
Team-oriented, project-based experience that culminates in the creation of an artifact; milestones include project selection and proposal, creative solution, report, presentation, and demonstration of the created device. **Prerequisite**: Taken in the last semester of the BS Program; ENGL 217. Annually.		

ELEC 405	Electrical System Design	3(3,0)
This course aims to teach students how to design various electrical systems based on equipment selection, protection systems, EMC and safety requirements, international standards, draw and interpret schematics and wiring diagrams, cost considerations, energy efficiency. **Prerequisite:** ELEC 210.		

ELEC 423	Electronics Circuit Design	3(3,0)
This course offers students a methodology of the design process with emphasis on the feasibility and preliminary design phases such as conditioning circuit, Op-amp and feed-back systems, filters, oscillators, sample/hold, DAC/ADC, Data acquisition Boards. Students will learn how to write proposals and reports as well as increasing their creativity through group projects from industry with inter-disciplinary topics. **Prerequisite**: ELEC 301, **Co-requisite**: ELEC 320.		

ELEC 431	Introduction to Renewable Energy Systems	3(3,0)
The aim of this course is to provide the student with information about the different renewable energy sources such as solar, wind, and wave energy as well as energy		

from biomass. This course will also illustrate how to link these sources with loads and how to synchronize them with the grid to deliver electricity reliably and efficiently. **Prerequisite:** ELEC 210.

ELEC 432	Power Electronics	3(3,0)
This course familiarizes the students with basic power switch technology and associated electronic circuits. In this course power electronic circuits and switching devices are studied. Their applications in AC/DC, DC/DC, DC/AC and AC/AC converters as well as switching power supplies are studied. **Prerequisite:** ELEC 320.		

ELEC 432L	Power Electronics Lab	1(0,2)
This Lab course is designed to teach students the fundamentals of power electronics. It covers the following topics: uncontrolled single and 3-phase rectifiers using diodes, controlled single phase and 3-phase rectifiers using thyristors, DC-to-AC converters, DC-to-DC buck and boost converters, applications on DIAC, TRIAC and IGBT. **Co-requisite:** ELEC 432.		

ELEC 451	Control Systems	3(3,0)
This course is to explore the modeling of linear dynamic systems via differential equations and transfer functions utilizing state-space and input-output representations; analysis of control systems in the time and frequency domains, study of the classical stability tests, such as the Routh-Hurwitz and Nyquist criterions, and design methods using root-locus plots and Bode plots; and the development of control techniques based on PID, lead and lag networks. **Prerequisite**: CCEE 331.		

ELEC 499	Co-op Work Experience	1(0,0)
This Co-op work experience is designed to provide students with five weeks of short-term work experience in the field of electrical engineering. Students are encouraged to network in the discipline-related industries. Report, poster, and power-point presentation are required. **Prerequisites**: ENGL 217 ; Senior Standing.		

ELEC 533	Advanced Electric Machines and Drives	3(3,0)
This course focuses on basic structure and principle of dc and ac drive systems. Constant flux and field weakening. Constant torque and constant hp operation. Effect of non-ideal waveform on motor performance. Application of Space Vector to ac machine analysis. Pulse Width Modulation techniques. Multi-level converters and multi-phase motor drives. Modern methods of motor control: Field Oriented Control, Direct Torque Control, etc. Methods of Sensor less Control. **Prerequisite:** ELEC 331 and ELEC 432.		

ELEC 534	Advanced Power Systems	3(3,0)
The course is designed to give students a deeper knowledge on the analysis of power systems by covering the following topics: Circuit models, Per unit representation, Network methods, Load-flow studies, Load-flow control, and Economic dispatch. It also covers the Symmetrical three-phase faults, Unsymmetrical faults, Power system stability, and computer methods. **Prerequisite**: ELEC 330.		

ELEC 595A	BE Summative Learning Project 1	1(1,0)
The first phase of a team-oriented, project-based experience that culminates in the creation of an artifact; milestones include: project selection and proposal, creative solution, report, presentation, and demonstration of the created device. **Prerequisite**: ENGL 217.		

ELEC 595B	BE Summative Learning Project 2	2(2,0)
The second phase of a team-oriented, project-based experience that culminates in the creation of an artifact; milestones include: project selection and proposal, creative solution, report, presentation, and demonstration of the created device. **Prerequisite**: ELEC 595A.		

II. Elective Courses

Students may meet their engineering technical electives requirements from the following selection of elective courses.

ELEC 406	Modeling and Simulation	3(3,0)
This course aims to teach the students the concept of representing, characterizing, understanding, analyzing, or solving real world problems through modeling and simulation. In this course, students are introduced to the tools and techniques used to model and simulate different systems varying from basic circuits to more advanced and complex technical systems found in various engineering domains. **Prerequisite:** PHYS 211 and ELEC 210.		

ELEC 433	High Voltage Engineering	3(3,0)
This course introduces high voltage engineering, withstand levels, S curves; insulation coordination; breakdown mechanisms. Non-destructive testing of apparatus; insulation resistance, partial discharge, measurements HV production for test objects. System over-voltages, switching, lightning and over-voltage protection devices. **Prerequisite:** ELEC 330.		

ELEC 434	Electrical Power Distribution	3(3,0)
This course gives general considerations; load characteristics; sub-transmission and distribution substations; primary and secondary distribution, secondary network systems; distribution transformers; voltage regulation and application of capacitors; voltage fluctuations; protective device coordination. **Prerequisite:** ELEC 330.		

ELEC 444	Electromagnetic Compatibility	3(3,0)
This course introduces Electromagnetic Interference, Conducted and Radiated Emission, Conducted and Radiated Susceptibility, Product slippage. EMC standards and Regulations. EMC Theory and Materials Relating to EMC design. EMC Measurement and test facilities. **Prerequisite:** ELEC 210.		

ELEC 498	Special Topics in Electrical Engineering	3(3,0)
This course is designed to enable students to study current special topics of interest which are carefully selected from ELEC-related topics. The contents of such a course are to be determined by the instructor and the department.		

ELEC 503	Artificial Neural Systems	3(3,0)
This course focuses on the foundations of neural network theory and their application in engineering, cognitive science, and artificial intelligence. The course covers also the foundations of machine learning and neural processing algorithms: supervised and unsupervised learning of feed forward and recurrent neural networks, perception layers, associative memories, feature maps.		

ELEC 504	Lasers and Laser Applications in Engineering	3(3,0)
This course is designed to give students a functional knowledge in lasers. The course covers light, atoms, absorption processes, and spontaneous and simulated emission of radiation. Moreover, laser types and characteristics are discussed. Laser sources, resonators, and amplifiers are discussed. In addition, applications in engineering, technology, and biomedical field applications will be discussed.		

ELEC 531	Electrical Power Systems for Transportation Applications	3(3,0)
Electrical power and energy systems are at the forefront of application developments in, for example, electric and hybrid road vehicles, more electric and all-electric aircraft, and traction applications. The associated hardware, technologies and control methods are crucial to achieving critical global targets in energy efficiency, low-carbon, and low-emissions operations. The greatest challenges occur when we combine new technologies at large-scale and often complex system levels. This course will be focus on the study of power systems and control equipment for electrical transportation, the course will focus on the equipment needed to support the new ways of electrical transportation such as Electric cars, aircrafts and tractions. **Corequisites**: ELEC 432.		

ELEC 532	Application of Power Electronics in Power Systems	3(3,0)
This course focuses on power electronic and its applications in power systems by covering the following topics: Flexible AC transmission systems (FACTS), conventional thyristor-controlled reactors and phase shifters, voltage source inverter (VSI) based static condenser (STATCON) and unified power flow controller (UPFC). **Prerequisites**: ELEC 330; ELEC 432.		

ELEC 535	Renewable Energy Systems for the Built Environment	3(3,0)
This course covers Energy and carbon emissions in the built environment: data for energy consumption within the built environment in Lebanon. Overview of building services – HVAC, Lighting, HWS, Lifts and Small Power; data and benchmarks for energy consumption by end use in buildings; methods of estimating predicted energy consumption in buildings; time-based energy demand schedules, importance of energy efficiency and the Lean-Clean-Green principle. **Prerequisite**: ELEC 210.		

ELEC 536	Renewable Energy Systems	3(3,0)
The aim of this course is to provide knowledge about energy production from renewable sources, the structure and nature of the interconnected electric power system and the critical need for environmentally sensitive solutions. In addition, the economic and regulatory policy aspects of electricity and electricity markets are discussed. The course covers the basics of Wind energy conversion systems, and micro grids with hybrid power sources. Modeling and control of renewable energy sources such as wind turbine generation, solar panel and fuel cell and power electronics interfaces will be presented. **Prerequisite**: ELEC 431.		

ELEC 542	Advanced Power Electronics	3(3,0)
This course is designed to provide students with a functional knowledge of modeling switching power converters, advanced power converter topologies, design constraints and control methods. It also covers the operation of multi-level DC/AC inverters and matrix converters. **Prerequisite**: ELEC 432.		

ELEC 550	Advanced Control Systems	3(3,0)
This course focuses on the formulation of the linear control problem by state space methods, frequency response and time response analysis; it introduces students to advanced concepts of controllability, observability, canonical forms, state transition matrices, stability, Nonlinear systems linearization as well as discrete and time-invariant systems. **Prerequisite**: ELEC 451.		

ELEC 551	Nonlinear Adaptive Control	3(3,0)
This course presents a comprehensive exposition of the theory of nonlinear dynamical systems and its control. It will focus on the methods of characterizing and understanding the behavior of systems that can be described by nonlinear ordinary differential equations, and as well as the methods for designing controllers for such systems. In this course, both classical and modern concepts from nonlinear system theory will be introduced. **Prerequisite**: ELEC 451.		

ELEC 560	Sustainable Energy	3(3,0)
This course is designed to provide you with the methods, tools, and perspectives to understand, critique, and ultimately influence the management of technical, economic, and policy choices regarding the options for energy generation and use. We will focus equally on the technical, economic, political, and environmental impacts of energy. **Prerequisites**: **ELEC 431**		

ELEC 561	Wind Energy Technology	3(3,0)
This course aims to provide the students with an in-depth understanding of the theoretical, technological, and economic aspects of wind energy systems. Upon successful completion of this course, students will be able to identify, assess and select the types of wind turbines, estimate the power output of specific wind energy devices and systems, assess the structural suitability of wind towers, and evaluate the key aspects of on-shore (urban) and off-shore wind energy systems. **Prerequisite**: ELEC 210.		

ELEC 562	Solar Energy Technology	3(3,0)
This course aims to provide students with a systematic understanding of current knowledge, problems, and insights in solar photo-voltaic technologies; enable students to evaluate current research and advances in the field; and assess solar PV technologies, developing critiques and proposing solutions. **Prerequisite**: ELEC 210.		

ELEC 563	Smart Grid Technology	3(3,0)
This course will examine smart grid technologies and the transformational impacts of the smart grid on the industry. Students in this course will learn the fundamentals of the smart grid: its purpose and objectives, its technologies, its architectures, and its management. Students will also learn many of the challenges facing the smart grid as part of its evolution. **Prerequisite:** ELEC 432		

ELEC 597	Advanced Topics in Electrical Engineering	3(3,0)
This course is designed to enable students to study a given advanced topic of interest, which is carefully selected from the Electrical engineering-related topics. The content outline of such a topic is to be determined by the instructor and to be approved by the department Chair. **Prerequisite**: Instructor's consent. On demand.		

MINOR IN RENEWABLE ENERGY SYSTEMS

Rationale

The College of Engineering/ECE department offers a minor in Renewable Energy Systems (RES). The minor aims to address the expected national, regional, and international need for personal experts in renewable energy systems for generation, transmission, and use of energy.

Program Objectives

The aims of the minor are to:

- Provide students with advanced expertise in renewable energy sources, systems and policies;
- Provide students with the necessary tools to contribute to the fast-growing renewable energy systems sector;
- Prepare undergraduate students for graduate studies in renewable energy.

Learning Outcomes

At the end of this minor, the student is expected to demonstrate ability to:

- Use current techniques, architectures, and tools to generate, store, and distribute energy from renewable sources;
- Design systems and tools to generate, store and distribute renewable energy.

Program Requirements

While most relevant to electrical engineering students, this minor is offered to undergraduate RHU students in the BE or MS program, from different engineering disciplines. It may also be offered to students with a BS/BE from other universities subject to a case-by-case evaluation of their transcripts and other specific RHU requirements.

Early in their major, interested RHU engineering students need to fill in the appropriate form declaring that they will be minoring in RES while completing their regular major.

To successfully complete the RES minor, a student must

1) Declare a minor in Renewable Energy Systems by completing the Minor Declaration Form;
2) Obtain the approval of the dean of the student's college major and the dean of the College of Engineering
3) Earn a Minor Cumulative Grade Point Average of no less than 70%.
4) Complete 18 credits of coursework as specified below.

It should be noted that overlapped courses between student major requirements and data renewable energy systems minor requirements are counted to fulfill the minor requirements. The student must complete a minimum of 3 credit hours of coursework that are not counted toward the requirement for his/her major or any other minor.

Career Options

The RES minor consists of six courses (18 credits) in which three are mandatory and three are electives, selected to satisfy the requirements of the proposed program objectives and learning outcomes.

Curriculum and Program

The RES minor consists of six courses (18 credits) in which three are mandatory and three are electives, selected to satisfy the requirements of the proposed program objectives and learning outcomes.

I. **Mandatory Courses**

The three mandatory courses (9 credits) are:

ELEC 320	Electronics	3(3,0)
ELEC 431	Introduction to Renewable Energy Systems	3(3,0)
ELEC 432	Power Electronics	3(3,0)

II. **Elective Courses**

Students may choose three elective courses (9 credits) from the following list.

ELEC 532	Application of Power Electronics in Power Systems	3(3,0)
ELEC 535	Renewable Energy Systems for the Built Environment	3(3,0)
ELEC 536	Renewable Energy Systems	3(3,0)
ELEC 542	Advanced Power Electronics	3(3,0)
ELEC 560	Sustainable Energy	3(3,0)
ELEC 561	Wind Energy Technology	3(3,0)
ELEC 562	Solar Energy Technology	3(3,0)
ELEC 563	Smart Grid Technology	3(3,0)
Approved Electives from other engineering programs		
Civil Engineering		
CIVE 506	LEED Principles in Construction Management	3(3,0)
CIVE 574	Environmental Policy and Management	3(3,0)
Computer and Communication Engineering		
CCEE 426	Design of Embedded Systems	3(3,0)
CCEE 564	Machine Learning and Data Mining	3(3,0)

Mechanical and Mechatronics Engineering		
MECH 453	Buildings and Energy	3(3,0)
MECH 471	Optimization in Engineering Design	3(3,0)
MECH 541	Renewable Energy	3(3,0)
MECA 581	Systems Engineering	3(3,0)

III. Courses Description

ELEC 320	**Electronics**	**3(3,0)**
This course covers semiconductors, PN junctions, diode theory and circuits, bipolar junction transistors, transistor fundamentals, transistor biasing, amplifiers, MOSFETs, and operational amplifiers. **Prerequisite**: ELEC 210.		

ELEC 431	**Introduction to Renewable Energy Systems**	**3(3,0)**
The aim of this course is to provide the student with information about the different renewable energy sources such as solar, wind and wave energy as well as energy from biomass. This course will also illustrate how to link these sources with loads and how to synchronize them with the grid to deliver electricity reliably and efficiently. **Prerequisite**: ELE210		

ELEC 432	**Power Electronics**	**3(3,0)**
This course familiarizes the students with basic power switch technology and associated electronic circuits. In this course power electronic circuits and switching devices are studied. Their applications in AC/DC, DC/DC, DC/AC and AC/AC converters as well as switching power supplies are studied. **Prerequisite:** ELEC 320.		

ELEC 560	**Sustainable Energy**	**3(3,0)**
This course is designed to provide you with the methods, tools and perspectives to understand, critique, and ultimately influence the management of technical, economic, and policy choices regarding the options for energy generation and use. We will focus equally on the technical, economic, political, and environmental impacts of energy. **Prerequisites**: **ELEC 431**		

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This course focuses on power electronic and its applications in power systems by covering the following topics: Flexible AC transmission systems (FACTS), conventional thyristor-controlled reactors and phase shifters, voltage source inverter (VSI) based static condenser (STATCON) and unified power flow controller (UPFC). **Prerequisites**: ELEC 330; ELEC 432.		

ELEC 535	**Renewable Energy Systems for the Built Environment**	**3(3,0)**
This course covers Energy and carbon emissions in the built environment: data for energy consumption within the built environment in Lebanon. Overview of building services – HVAC, Lighting, HWS, Lifts and Small Power; data and benchmarks for energy consumption by end use in buildings; methods of estimating predicted energy		

consumption in buildings; time-based energy demand schedules, importance of energy efficiency and the Lean-Clean-Green principle. **Prerequisite:** ELEC 210.

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The aim of this course is to provide knowledge about energy production from renewable sources, the structure and nature of the interconnected electric power system and the critical need for environmentally sensitive solutions. In addition, the economic and regulatory policy aspects of electricity and electricity markets are discussed. The course covers the basics of Wind energy conversion systems, and micro grids with hybrid power sources. Modeling and control of renewable energy sources such as wind turbine generation, solar panel and fuel cell and power electronics interfaces will be presented. **Prerequisite**: ELEC 431.		

ELEC 542	Advanced Power Electronics	3(3,0)
This course is designed to provide students with a functional knowledge of modeling switching power converters, advanced power converter topologies, design constraints and control methods. It also covers the operation of multi-level DC/AC inverters and matrix converters. **Prerequisite:** ELEC 432.		

ELEC 561	Wind Energy Technology	3(3,0)
This course aims to provide the students with an in-depth understanding of the theoretical, technological, and economic aspects of wind energy systems. Upon successful completion of this course, students will be able to identify, assess and select the types of wind turbines, estimate the power output of specific wind energy devices and systems, assess the structural suitability of wind towers, and evaluate the key aspects of on-shore (urban) and off-shore wind energy systems. **Prerequisite:** ELEC 210.		

ELEC 562	Solar Energy Technology	3(3,0)
This course aims to provide students with a systematic understanding of current knowledge, problems and insights in solar photo-voltaic technologies; enable students to evaluate current research and advances in the field; and assess solar PV technologies, developing critiques and proposing solutions **Prerequisite:** ELEC 210.		

ELEC 563	Smart Grid Technology	3(3,0)
This course will examine smart grid technologies and the transformational impacts of the smart grid on the industry. Students in this course will learn the fundamentals of the smart grid: its purpose and objectives, its technologies, its architectures, and its management. Students will also learn many of the challenges facing the smart grid as part of its evolution. **Prerequisite:** ELEC 432		

COMPUTER AND COMMUNICATIONS ENGINEERING PROGRAM

Mission

Mission
The CCE program aims to help students explore their innate creativity and potential and endow them with the knowledge, skills, and abilities to pursue successful careers in computer and communication engineering and related fields; think critically in solving complex problems using modern tools and technologies; communicate and work effectively with diverse groups; learn more every day, and succeed in graduate studies in renowned institutions if they so choose.

Objectives

The program educational objectives are to enable students to:

1. Foster an environment that encourages excellence in endeavor.
2. Provide quality and professional education which prepare leaders.
3. Solve problems facing the society and industry in Lebanon, the Middle East and the world.
4. Engage in multidisciplinary research.

Program Learning Outcomes

The Computer and Communication Engineering program adopts the learning outcomes of ABET so our graduates will have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. an ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Accreditation

The Bachelor of Engineering program in Computer and Communications Engineering is accredited by the Engineering Accreditation Commission (EAC) of **ABET**, 415 North Charles Street, Baltimore, MD 21201; www.abet.org.
Career Opportunities

A CCE graduate can pursue successful careers in related fields such as computer software, computer hardware, artificial intelligence, signal processing, computer networks, and wired or wireless communication.

CCE graduates create new opportunities for businesses by driving new technologies. They also devise engineering solutions to make businesses more productive and competitive. Moreover, they assist businesses to develop robotics and multimedia systems involving speech and image processing. CCE graduates also design embedded computer systems, such as the computerized controls in a connected autonomous electric vehicle.

As artificial intelligence experts, CCE graduates contribute to the evolution of this relatively new and vastly expanding area. Today, artificial intelligence is considered a big advantage for any engineer in a plethora of domains, such as robotics, social media, computer science, business, marketing, medical applications, telecommunication, civil engineering, and control systems.

Signal processing departments are the main blocks for the success of companies in many disciplines, such as biomedical industry, telecommunication manufacturers, multimedia manufacturers, and security industry. CCE graduates are the main Engineers responsible for such departments.

CCE graduates design, implement, and maintain the digital communication networks that surround us. In this field, telecommunication operators such as Alfa and Touch employ CCE graduates as do equipment manufacturers such as Cisco, Huawei, and the IT departments of many organizations such as hospitals and banks. CCE graduates also have the skills to run their own computer or network services business.

CCE graduates can work at telecommunications operators or equipment manufacturers as radio planners, optimizers, and integrators; transmission planners and integrators; circuit switching/packet switching core experts; customer relationship managers; sales engineers/managers or operation and maintenance engineers.

Program Overviews

The Computer and Communications Engineering Program at Rafik Hariri University sets the best of students' interests, first and foremost. Every little experience the student attains represents a block in the building of a competent, confident, purposeful, problem solving, competitive, responsible, and conscientious individual. This is accomplished by means of a curriculum tailored to the market needs, and facilities that conform to the highest of standards, top notch faculty members, who graduated from premiere higher education institutions, who are committed to the academic and personal growth of the student, and an environment that inspires learning and drives creativity.

The Bachelor of Engineering (BE) program in Computer and Communications Engineering encompasses 147 credit hours spread over eight regular semesters and three summer semesters. The Bachelor of Science (BS) program comprises a total of 114 credit hours spread over six regular semesters and three summer semesters. In addition to completing the credits requirements, a BS or a BE degree is only conferred upon a student if their earned Cumulative GPA, Major GPA, and the Summative Learning Project grade are all 70 or above.

The required credit hours are divided into three categories: University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours for the BS and BE programs are shown in the following table:

BS in Computer and Communication Engineering (114 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	3	0	19	6	28	24
College Requirement	0	0	25	3	28	24
Program Requirement	44	0	14	0	58	52
Credits	47	0	58	9	114	100

BE in Computer and Communication Engineering (147 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	3	0	19	9	31	21
College Requirement	0	0	28	3	31	21
Program Requirement	56	15	14	0	85	58
Credits	59	15	61	12	147	100

I. University Requirements (General Education)

The list of the GE required courses and their descriptions are presented in the introductory pages of the College of Engineering section in this catalog.

II. College Requirements

The list of the College required courses and their descriptions are presented in the introductory pages of the College of Engineering section in this catalog.

III. Program Requirements

The program requirements for a Bachelor of Engineering degree in Computer and Communications Engineering (CCE) encompass 86 credits (59 credits for the BS degree) distributed as follows: 71 credits mandatory courses (59 credits for the BS degree) and 15 credits (0 credits for the BS degree) of engineering technical elective courses for BE only.

A. Mandatory Requirements

The major and non-major CCE program mandatory courses are listed in the table below.

Course #	Title	Credits	Pre/ Co-requisites
CCEE 221+221L	Logic Design and Lab	4	
CCEE 216	Advanced Programming and Data Structure	3	CCEE 214
CCEE 310	Software Engineering	3	CCEE 214
CCEE 315	Database Management Systems	3	CCEE 214
CCEE 324	Computer Organization	3	CCEE 221
CCEE 331	Signals and Systems	3	MATH 211
CCEE 341	Communication Systems	3	CCEE 331
CCEE 460	Artificial Intelligence	3	CCEE 214
CCEE 411	Web Programming	3	Co-req.: CCEE 214
CCEE 411L	Internet Engineering and Web Programming Lab	1	Co-req.: CCEE 411
CCEE 426+426L	Design of Embedded Systems and Lab	4	CCEE 221
CCEE 444	Antennas and Propagation	3	ELEC 340
CCEE 444L	Antennas and Propagation Lab	1	Co-req.: CCEE 444
CCEE 447+447L	Digital Communications and Communications Lab	4	CCEE 341
CCEE 449	Wireless Communications	3	Co-req.: CCEE 447
CCEE 354+454L	Computer Networks and Lab	4	Co-req.: CCEE 221
CCEE 460L	Artificial Intelligence Lab	1	Co-req.: CCEE 460
CCEE 499	Co-op Experience	1	ENGL 217
CCEE 528	Computer Architecture	3	CCEE 324

CCEE 534	Signal Processing	3	CCEE 331
CCEE 543	Mobile Communications	3	Co-req.: CCEE 449
CCEE 562	Artificial Intelligence	3	CCEE 214
CCEE 564	Machine Learning and Data Mining	3	CCEE 214; MATH 351 or BADM 250
CCEE 595A	BE Summative Learning Project 1	1	ENGL 217
CCEE 595B	BE Summative Learning Project 2	2	CCEE 595A
CCEE xxx	Technical Electives	15	
ELEC 200	Introduction to Electrical and Computer Engineering	3	
ELEC 320+320L	Electronics and Lab	4	ELEC 210
ELEC 340	Engineering Electromagnetics	3	PHYS 211

* Required for BS bound students. BE students take technical elective instead.

B. Technical Electives

As part of the Bachelor of Engineering degree program in CCE, the student is required to take 15 credit hours of engineering technical elective courses. Students must be at a senior standing to be able to take engineering technical electives. Technical electives allow the student to focus on a specific area for in-depth knowledge and understanding. The student can also mix and match engineering technical elective courses from different areas to get a more general exposure to the different CCE disciplines. Students should select, in cooperation with their academic advisor, the list of electives that best meet their needs and aspirations. The listed engineering technical elective courses and other courses from other engineering programs, in addition to the required program courses, are designed to allow the student to develop in-depth knowledge and understanding in the following areas:

1. Computer Software
2. Computer Hardware
3. Signal Processing
4. Communication Systems
5. Computer Networks
6. Artificial Intelligence

The list of additional available CCE electives is given in the table below:

Course #	Title	Credits	Pre-/Co-requisites
CCEE 498	Special Topics in Computer and Communication Engineering	3	
CCEE 597	Advanced Topics in Computer and Communication Engineering	3	Senior Standing
Computer Software			
CCEE 511	Mobile Application Development	3	CCEE 214
CCEE 513	Operating Systems	3	CCEE 214
CCEE 514	Advanced Web Programming	3	CCEE 411
CCEE 515	Distributed Computing	3	CCEE 528

CCEE 516	Advanced Programming and Database Management Systems	3	CCEE 315 or equivalent
Computer Hardware			
CCEE 520	Parallel Processing	3	CCEE 221
CCEE 521	Hardware-Software Co-Design	3	CCEE 221
Signal Processing			
CCEE 535	Digital Signal Processing	3	CCEE 331
CCEE 536	Digital Image Processing	3	CCEE 214
Communication Systems			
CCEE 540	Satellite Communication Systems	3	CCEE 447
CCEE 542	Microwave Communications	3	ELEC 340
CCEE 545	Advanced Mobile Communications	3	Co-requisite: CCEE 449
CCEE 546	Array Processing	3	CCEE 544
CCEE 547	Optical Communications	3	CCEE 447
Computer Networks			
CCEE 552	Network Security	3	Co-req: CCEE 354
CCEE 553	Advanced Communication Networks	3	CCEE 354
CCEE 554L	Computer Networks Lab 2	1	Co-req: CCEE 354L
CCEE 555	Advanced Computer Networks	3	CCEE 354
CCEE 555L	Computer Networks Lab 3	1	CCEE 354L
CCEE 556	Network and System Administration	3	CCEE 354
CCEE 556L	Computer Networks Lab 2	1	Co-req: CCEE 354L
Artificial Intelligence			
CCEE 561	Computer Vision	3	CCEE 214
CCEE 563	Robotics	3	
CCEE 566	Natural Language Processing	3	CCEE 214
CCEE 567	Optimization	3	Math 211 or equivalent
CCEE 568	Big Data and Analytics/Big data System	3	CCEE 564 or equivalent

RHU is a CISCO academy. As such students will be awarded CISCO certificates after completing the required Computer Networks Lab 1 in addition to the following three labs which will be counted as equivalent to one technical elective.

Course #	Title	Credits	Pre-/Co-requisites
Computer Networks			
CCEE 554L	Computer Networks Lab 2	1	Co-req.: CCEE 354L
CCEE 555L	Computer Networks Lab 3	1	CCEE 554L
CCEE 556L	Computer Networks Lab 4	1	Co-req.: CCEE 555L

Undergraduate students can also take 600 level courses if their cumulative GPA is higher than 80 and the instructor of the course approves.

Students may take up to 9 credits of (400 level or above) engineering technical electives from other programs.

C. Summative Learning Project

Students must complete a 3- credit hours course for BS (3-credits for BE; taken 1 credit in the first regular semester and 2 credits in the following regular semester) in which they work, preferably in groups, on a problem of concern to industry or the community at large, or to innovate a promising idea.

D. Co-op Experience

Students must complete 8 weeks of practical training working in an area related to their field of interest. The Co-op experience is usually fulfilled during the summer semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on the student's progress throughout the Co-op period by conducting field visits and ensuring that the student's performance is aligned with his/her aspirations and employer's needs. Students are required to submit a formal report, a poster and make a formal presentation about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to stipulate additional conditions.

Course Coding

The courses offered in the CCE program are designated code numbers in the form of (CCEE abc) where:

a	Designates the year (level)
b	Designates the focus area as follows: 0: General; 1: Computer Software; 2: Computer Hardware; 3: Signal Processing; 4: Communication Systems; 5: Computer Networks; 6: Artificial Intelligence
c	Designates the course sequence in a focus area

Study Plan

The following study plan summarizes the courses and credits distribution for the Bachelor of Science (BS) and Bachelor of Engineering (BE) in CCE. The study plan serves as a roadmap to facilitate student's smooth progression toward graduation.

Course #	Title	Credits	Pre-/Co-requisites
Year 1, Fall Semester (16 Credits)			
CCEE 214	Introduction to Programming	3	
ENGL 210	English Composition and Rhetoric	3	Placement

ELEC 200	Introduction to Electrical and Computer Engineering	3	
MATH 211	Calculus III	4	
PHYS 211	Physics: Electricity and Magnetism and Lab	3	
Year 1, Spring Semester (15 Credits)			
CCEE 216	Advanced Programming and Data Structure	3	CCEE 214
CCEE 221	Logic Design	3	
ELEC 210	Electric Circuits	3	PHYS 191 or Equivalent
MATH 311	Linear Algebra and Applications	3	
	Science Elective	3	
Year 1, Summer Semester (10 Credits)			
CCEE 221L	Logic Design Lab	1	Co-req.: CCEE 221
MATH 351	Probability and Statistics	3	MATH 211
PHYS 312	Modern Physics	3	
	Social Sciences Elective	3	
Year 2, Fall Semester (16 Credits)			
CCEE 324	Computer Organization	3	CCEE 221
CCEE 331	Signals and Systems	3	MATH 211
ELEC 320	Electronics	3	ELEC 210
ELEC 320L	Electronics Lab	1	Co-req.: ELEC 320
ENGL 217	Professional English Communication	3	ENGL 210
MATH 314	Ordinary Differential Equations	3	MATH 211
Year 2, Spring Semester (16 Credits)			
CCEE 310	Software Engineering	3	CCEE 214
CCEE 315	Database Management Systems	3	CCEE 214
CCEE 341	Communication Systems	3	CCEE 331
CCEE 354	Computer Networks	3	Co-req.: CCEE 221
CCEE 354L	Computer Networks Lab 1	1	Co-req.: CCEE 354
ELEC 340	Engineering Electromagnetics	3	PHYS 211
Year 2, Summer Semester (9 Credits)			
ENGR 300	Engineering Economy and Management	3	
MATH 421	Numerical Analysis	3	MATH 311
	Humanities Elective	3	
Year 3, Fall Semester (14 Credits)			
CCEE 411	Web Programming	3	Co-req.: CCEE 214
CCEE 444	Antennas and Propagation	3	ELEC 340
CCEE 444L	Antennas and Propagation Lab	1	Co-req.: CCEE 444
CCEE 447	Digital Communications	3	CCEE 341
CCEE 426	Design of Embedded Systems	3	CCEE 221
CCEE 426L	Design of Embedded Systems Lab	1	Co-req.: CCEE 426
Year 3, Spring Semester (17 Credits)			
CCEE 447L	Communications Lab	1	Co-req.: CCEE 447

CCEE 449	Wireless Communications	3	Co-req.: CCEE 447
CCEE 460	Artificial Intelligence	3	CCEE 214

CCEE 460L	Artificial Intelligence Lab	1	Co-req.: CCEE 460
ARAB 212	Arabic Language & Communication	2	
CMNS 200	Etiquette	1	Co-req.: ENGL 210
MATH 210	Discrete Mathematics	3	MATH 211
	Engineering Technical Elective 1*	3	
Year 3, Summer Semester (1 Credits)			
CCEE 499	Co-op Work Experience	1	ENGL 217
The above 114 credits complete the requirements for a Bachelor of Science degree in Computer and Communication Engineering			
Year 4, Fall Semester (16 Credits)			
CCEE 534	Signal Processing	3	CCEE 331
CCEE 528	Computer Architecture	3	CCEE 324
CCEE 595A	BE Summative Learning Project 1	1	ENGL 217; Senior Standing
ENGR 510	Engineering Project Management	3	ENGR 300
	Engineering Technical Elective 2	3	
	Engineering Technical Elective 3	3	
Year 4, Spring Semester (17 Credits)			
CCEE 543	Mobile Communications	3	Co-req.: CCEE 449
CCEE 564	Machine Learning and Data Mining	3	CCEE 214; MATH 351 or BADM 250
CCEE 595B	BE Summative Learning Project 2	2	CCEE 595A
	Engineering Technical Elective 4	3	
	Engineering Technical Elective 5	3	
	Social Sciences/ Humanities Elective II	3	
Total BE credits: 147			

* BS bound students are required to take CCEE 400 – Summative Learning (BS) Project instead.
Note: Engineering Technical Electives (levels 400 or above) are selected as such:
6 credits restricted Departmental Electives
9 credits from any Engineering discipline of level 400 or above.

Courses Description

I. Mandatory Courses

Non-Major Courses

Description of the non-major mandatory courses follows.

ELEC 200	**Introduction to Electrical and Computer Engineering**	**3(3,0)**
In this course the student will be trained in core skills to equip them to excel in electrical, biomedical and computer and communications engineering. The student will be trained in application programming using an appropriate programming environment. Students		

will build on the basics of Programming learned in the introductory programming course to implement Digital Signal Processing applications and perform data analysis. Students will also be introduced to basic lab equipment such as Oscilloscopes, Function Generators, Multi-Meters. Students will be introduced to microcontrollers-based projects to explore more the Electrical and Computer Engineering majors (CCE, BIOM and ELEC major). Throughout the course, students will be working in multidisciplinary teams to study cases of Engineering for the community as well as implement a project to answer a need in the community.

ELEC 210	**Electric Circuits**	**3(3,0)**
This course covers circuit elements and laws, mesh and node equations, network theorems, energy storage elements, RC, RL, and RLC circuits, transformers, sinusoidal (AC) steady state analysis, power calculation, and introduction to three phase circuit. **Prerequisite**: PHYS 191 or Equivalent.		

ELEC 320	**Electronics**	**3(3,0)**
This course covers semiconductors, PN junctions, diode theory and circuits, bipolar junction transistors, transistor fundamentals, transistor biasing, amplifiers, MOSFETs, and operational amplifiers. **Prerequisite:** ELEC 210.		

ELEC 320L	**Electronics Lab**	**1(0,2)**
This is a Lab course with experiments in Electrical and Electronic Circuits. It covers passive electrical elements and sources; lab instruments; voltage divider circuits; Thevenin's theorem; RC circuits; diode circuits; Op-Amp circuits; BJT and MOSFET characteristics. **Co-requisite:** ELEC 320.		

ELEC 340	**Engineering Electromagnetics**	**3(3,0)**
Introduction to vector analysis, Electrostatic fields in vacuum and dielectrics Conductors, Capacitance, Electrostatic energy and forces, Poisson's equation. Magnetic fields Maxwell's equations, electric and magnetic static fields, boundary-value problems, Laplace's and Poisson's equation, and electromagnetic static fields. Time dependent Maxwell's equations and Plane wave propagation. **Prerequisite**: PHYS 211.		

ENGL 210	**English Composition and Rhetoric**	**3(3,0)**
This course reviews the fundamentals of good academic writing in English, teaches essay writing essentials and research skills in two rhetorical modes (persuasion and argumentation), and provides practice in writing essays in these modes, research paper, and oral presentation. **Prerequisite:** ENGL 101 or TOEFL 550+ (paper) or 80+ (computer).		

ENGL 217	**Professional English Communication**	**3(3,0)**
This is a required course designed to help students develop effective professional communication skills, both orally and in writing. In this course, students learn how to write emails, memos, letters, proposals, reports, and other forms of employment correspondence. In addition, this course helps students sharpen their presentation		

skills. Broadly, this course enables students to behave professionally and effectively in their prospective jobs. **Prerequisite**: ENGL 210.

ENGR 300	**Engineering Economics and Management**	**3(3,0)**
Concepts and techniques in basic Engineering economy principles and applications. Interest and financial mathematics; present worth, annual worth, benefit/cost ratio, internal rate of return, multiple alternatives, income tax, inflation, Risk analysis, Investment and investment choice, equivalence, loans, cost of capital, retirement and replacement, sector analysis and viewpoint, sensitivity analysis, accounting and financial statements.		

ENGR 510	**Engineering Project Management**	**3(3,0)**
The course covers key components of engineering project management including projects election and planning, project time management, cost estimation and pricing, contract and specifications, quality management, engineering ethics and professional conduct, realizing impact of engineering solutions in various contexts (global, economic, environmental, societal, etc...), sustainability in engineering designs, human resources consideration, communications, risk management, and procurement management. **Prerequisite:** ENGR 300.		

MATH 210	**Discrete Mathematics**	**3(3,0)**
Logic, propositional equivalences, predicates and quantifiers, methods of proof, proof strategy, mathematical induction, recursive definitions and structural induction, sets and set operations, functions, growth of functions, basics of counting, permutations and combinations, Binomial theorem, relations and their properties, representing relations, equivalence relations, introduction to graphs, graph terminology, introduction to trees.		

MATH 211	**Calculus III**	**4(4,0)**
Hyperbolic functions and their inverses, infinite sequences and series, polar coordinates, cylinders and quadric surfaces, functions of several variables, partial derivatives, Multiple integrals in rectangular, cylindrical, and spherical coordinates, substitutions.		

MATH 311	**Linear Algebra with Applications**	**3(3,0)**
Systems of linear equations, matrix algebra, linear transformations, determinants, vector spaces, eigenvalues and eigenvectors, symmetric matrices, orthogonality, diagonalization.		

MATH 314	**Ordinary Differential Equations**	**3(3,0)**
First order linear differential equations, linear differential equations of second and higher order, linear differential equations with variable coefficients, series solutions, Legendre's and Bessel's equations, systems of differential equations, Laplace transforms and their inverses. **Prerequisite:** MATH 211.		

MATH 351	Probability and Statistics	3(3,0)
Probability and conditional probability, Discrete and continuous random variables, marginal distributions, expectation, variance-mean-median-covariance and correlation, conditional expectation, binomial, multinomial and Poisson distributions, Normal distribution, Sampling distribution, Prediction and confidence intervals, Hypothesis testing. **Prerequisite**: MATH 211.		

MATH 421	Numerical Analysis	3(3,0)
Error Analysis, solutions of nonlinear equations using fixed point- Newton-Raphson-Muller's methods, solution of linear system using Gaussian elimination-iterative methods, interpolation and approximation using Taylor series-Lagrange approximation-Newton polynomials, numerical differentiation and integration, numerical optimization, solutions of ordinary and partial differential equations using Euler's and Heun's and Rung-Kutta methods. **Prerequisite**: MATH 311.		

PHYS 211	Physics: Electricity and Magnetism and Lab	3(3,1)
This course covers fundamental topics in Electricity and Magnetism: Electric forces and Electric Fields for discrete and continuous charge distribution, Gauss's Law, Electric Potential, Capacitance and Dielectrics, Kirchhoff's rules, Magnetic Fields and Forces, Biot-Savart Law, Ampere's Law, Magnetic Flux and Gauss's Law in Magnetism. It also includes a laboratory component that introduces students to the "real world" by offering a set of experiments in electricity and magnetism. **Prerequisite**: None.		

PHYS 312	Modern Physics	3(3,0)
This course introduces the principles of revolutionary developments of the 20th century. It covers interaction of light and matter (Photoelectric effect, Compton, Auger, etc.), the dual nature of light, various models of atomic description, quantum numbers, relativistic approach, Heisenberg Uncertainty Principle, Schrodinger Equation, and an introduction to the band theory of solids and to particle physics.		

Major Courses

Mandatory computer and communications engineering courses are described below.

CCEE 214	Introduction to Programming	3(2,2)
This course presents the fundamentals of structured programming concepts. It covers primitive data types, expressions, control statements, functions, arrays, basic searching/sorting algorithms, and introduction to pointers. **Prerequisite**: None. Equivalent to COSC 214.		

CCEE 216	Advanced Programming and Data Structures	3(2,2)
This course covers advanced object-oriented programming concepts including overloading, inheritance, polymorphism. In addition, the course covers data structures concepts including analysis, sorting and searching algorithms, stacks, queues, trees, and graphs. **Prerequisite**: CCEE 214. Equivalent to COSC 215.		

CCEE 221	Logic Design	3(3,0)
This course addresses Boolean algebra and logic simplification techniques, data representation, and the design of combinational logic networks for decoders, encoders, multiplexers, and demultiplexers; design of sequential logic devices including flip-flops, registers, and counters, as well as analysis of devices used to build logic networks, including programmable logic devices. **Equivalent to** COSC 351.		

CCEE 221L	Logic Design Lab	1(0,2)
This Lab covers design techniques and implementation of combinational and sequential logic circuits. Experiments include logic gates, design and implementation of logic circuits, combinational logic circuits (decoders, encoders, multiplexers, demultiplexers and adders), and design of sequential logic devices using flip-flops, registers, and counters. **Co-requisite**: CCEE 221. **Equivalent to** COSC 351L.		

CCEE 310	Software Engineering	3(3,0)
Analysis, design, construction, maintenance, and evolution of large software systems are covered. Students are introduced to the system life cycle, project management techniques, and database systems. Analysis, design, and implementation of software systems are also included. **Prerequisite**: CCEE 214. **Equivalent to** COSC 341.		

CCEE 315	Database Management Systems	3(3,0)
The course covers the nature and purpose of database systems, introduction to data modeling: Entity Relationship Model, Relational Model with relational algebra, relational calculus, and SQL; integrity constraints; file organization and index files; normalization. It also covers an introduction to object databases, data mining, schema evolution, distributed databases, web enabled databases, and databases for e-commerce applications **Prerequisite**: CCEE 214. **Equivalent to** COSC 231.		

CCEE 324	Computer Organization	3(3,0)
Computer system organization and design, implementation of CPU data path and control, instruction set design, memory hierarchy (caches, main memory, virtual memory) organization and management, input/output subsystems (bus structures, interrupts, DMA), performance evaluation, pipelined processors. **Prerequisite**: CCEE 221. **Equivalent to** COSC 353.		

CCEE 331	Signals and Systems	3(3,0)
This course covers mathematical description and classification of continuous and discrete signals and systems. Topics include types of signals and systems, Fourier series, Fourier transforms, Discrete-Time Fourier transforms (DTFT), Discrete and Fast Fourier Transforms (DFT and FFT), Laplace transforms, z-transforms, transfer functions. **Prerequisite:** MATH 211		

CCEE 341	Communication Systems	3(3,0)
This course introduces the fundamentals of transmission and reception in communication systems and the effect of noise. Topics include power spectral density, amplitude modulation and demodulation, angle modulation and demodulation, analog		

communication system performance in the presence of noise, sampling and analog-to-digital conversion, introduction to digital modulations. **Prerequisite**: CCEE 331.

CCEE 460	Artificial Intelligence	3(3,0)
This course introduces students to the basic knowledge representation and learning methods of artificial intelligence. The emphasis will be on understanding the fundamental artificial intelligence concepts, as well as being able to practically apply the corresponding approaches in solving practical problems and developing useful software applications. Covered topics include intelligent agents, informed and uninformed search strategies, and adversarial search. **Prerequisite**: CCEE 214 or equivalent.		

CCEE 400	Summative Learning (BS) Project	3(3,0)
Team-oriented, project-based experience that culminates in the creation of an artifact; milestones include project selection and proposal, creative solution, report, presentation, and demonstration of the created device. **Prerequisite**: Taken in the last semester of the BS Program; ENGL 217.		

CCEE 411	Web Programming	3(3,0)
This course teaches students how to develop and implement web-based programs with emphasis on interface programming. It introduces students to web development and to different client and server-side languages and styles needed to develop adequate and responsive websites. The course covers HTML5, CSS3, JavaScript/jQuery, PHP and responsive design. **Co-requisite:** CCEE 214. Equivalent to COSC 333.		

CCEE 411L	Internet Engineering and Web Programming Lab	1(0,2)
This lab gives the student hands-on skills in Web programming. Experiments mainly cover the following topics: HTML and CSS, JavaScript and JQuery, Responsive web design, Bootstrap, Web content management systems, server-side development. **Co-requisite:** CCEE 411.		

CCEE 426	Design of Embedded Systems	3(3,0)
This course addresses the design of embedded real-time systems, models of computation, validation techniques, and automatic synthesis. Finite state machines, synchronous languages, data flow networks, petri nets, software optimization and performance estimation, operating systems and scheduling, system-level simulation, and interface-based design. **Prerequisite**: CCEE 221. Equivalent to COSC 356.		

CCEE 426L	Design of Embedded Systems Lab	1(0,2)
This lab complements topics covered in the CCEE 426 course. It involves design of embedded real-time systems, models of computation, validation techniques, and automatic synthesis. Experiments include Design using finite state machines, synchronous languages, data flow networks, petri nets, software optimization and performance estimation, scheduling, system-level simulation, and interface-based design. **Co-requisite**: CCEE 426. Equivalent to COSC 356L.		

CCEE 444	Antennas and Propagation	3(3,0)
This course introduces the fundamental principles of antenna and propagation for communications-oriented electrical engineers. Topics include: fundamental parameters of antennas, wire antennas, analysis and design of linear antenna arrays, radio wave propagation, free space path loss and link budget. **Prerequisite**: ELEC 340.		

CCEE 444L	Antennas and Propagation Lab	1(0,2)
This lab provides students with hands-on experience in simulating and designing basic antennas using a microwave computational tool. It includes also a demonstration on the basic antennas performance measurements. **Co-req.**: CCEE 444.		

CCEE 447	Digital Communications	3(3,0)
This course introduces the basic structures and fundamentals of modern digital communication systems. Topics include: deterministic and random signal analysis; signal space representation; maximum-likelihood detection; coherent and non-coherent digital modulation schemes (ASK, PSK and M-PSK, FSK and M-FSK, M-QAM); error probabilities; bandwidth efficiency and energy efficiency tradeoffs; inter-symbol interference (ISI) and pulse shaping; matched filter and optimal receiver; source coding. **Prerequisite**: CCEE 341.		

CCEE 447L	Communications Lab	1(0,2)
This Lab is taken with CCEE 447. The student will acquire knowledge on implementing and analyzing analog and digital communication systems using NI EMONA Add-in Module and NI USRP. **Co-requisite:** CCEE 447.		

CCEE 449	Wireless Communications	3(3,0)
Wireless communications is omnipresent in today's world. It does not transport conversational information only, but it is used for a plethora of tasks; from short-range exchange of photos using Bluetooth to satellite communication and deep space information transfer; from few bits used to control robots and sensory information to big data collection. This course introduces current wireless systems and standards, shadowing and multi-path fading effects in wireless communications, radio channel capacity, multiple access techniques, channel coding methods. **Co-requisite:** CCEE 447.		

CCEE 354	Computer Networks	3(3,0)
This course enables students to gain fundamental knowledge of computer networks, appreciate various tradeoffs and choices in networking, learn to design and analyze protocols, and get ready for studying advanced topics in the field of networks. **Co-requisite**: CCEE 221. Equivalent to COSC 360.		

CCEE 354L	Computer Networks Lab I	1(0,2)
This Lab helps prepare students seeking to pass advanced Cisco Certifications. The student will acquire the knowledge of the functionalities of network equipment and protocols, learn how to build a simple Ethernet network using routers, switches and computers, and use router CLI commands to perform basic configuration and		

verification. The student will also learn valuable network problem solving techniques and concepts. **Co-requisite**: CCEE 354.

CCEE 460L	Artificial Intelligence Lab	1(0,2)
This lab will help prepare students to handle the huge amount of data produced by both humans and machines today. The student will learn to use state of the art AI tools to analyze data and make complex decisions based on that data using real-world practical examples and case studies. At the end of the lab, the student will be able to apply AI knowledge at work or even in day-to-day life to drive better decisions in their field of work using AI. **Co-req.:** CCEE 460.		

CCEE 499	Co-op Work Experience	1(0,0)
This Co-op work experience is designed to provide students with an eight-week short-term work experience in the field of computer and communication engineering. Students are encouraged to network in discipline-related industries. A report, poster, and power-point presentation are required. **Prerequisites**: Senior Standing. ENGL 217.		

CCEE 528	Computer Architecture	3(3,0)
Computer system organization and design, implementation of CPU data path and control, instruction set design, memory hierarchy (caches, main memory, virtual memory) organization and management, input/output subsystems (bus structures, interrupts, DMA), performance evaluation, pipelined processors. **Prerequisite**: CCEE 324. **Equivalent to** COSC 353.		

CCEE 534	Signal Processing	3(3,0)
This course covers time series analysis, frequency analysis, time-frequency analysis, and time-scale analysis. It also covers the design of digital filters and signal modeling. **Prerequisite**: CCEE 331.		

CCEE 543	Mobile Communications	3(3,0)
This course deals with the evolution of cellular technologies from 2G to LTE: cellular systems; medium access techniques; wireless standardization; GSM networks (history, architecture overview, access network, GSM air interface, dimensioning aspects, network design and planning, handover, call handling, network operation); 3G mobile systems architecture, 3G air interface, protocols and procedures used in 3G, 3G functionalities such as: idle mode camping, power control and capacity management, handover in 3G; introduction to 4G/LTE. **Co-requisite**: CCEE 449.		

CCEE 562	Artificial Intelligence	3(3,0)
This course introduces students to the basic knowledge representation and learning methods of artificial intelligence. The emphasis will be on understanding the fundamental artificial intelligence concepts, as well as being able to practically apply the corresponding approaches in solving practical problems and developing useful software applications. Covered topics include intelligent agents, informed and		

uninformed search strategies, and adversarial search. **Prerequisite**: CCEE 214 or equivalent.

CCEE 564	**Machine Learning and Data Mining**	**3(3,0)**
This course introduces students to the basic knowledge representation and learning techniques. The emphasis consists of understanding the data mining process, as well as being able to practically apply the corresponding approaches in solving practical problems and developing intelligent software applications. The course covers several topics that lie within classification, prediction and clustering. **Prerequisite**: CCEE 214. Equivalent to COSC 480.		

CCEE 595A	**Summative Learning Project 1**	**1(1,0)**
The first phase of a team-oriented, project-based experience culminates in the creation of an artifact; milestones include: project selection and proposal, creative solution, report, presentation, and demonstration of the created device. **Prerequisites**: ENGL 217, Senior Standing.		

CCEE 595B	**BE Summative Learning Project 2**	**2(2,0)**
The second phase of a team-oriented, project-based experience that culminates in the creation of an artifact; milestones include: project selection and proposal, creative solution, report, presentation, and demonstration of the created device. **Prerequisite:** CCEE 595A.		

II. Elective Courses

Students may meet their engineering technical electives requirements from the following selection of elective courses.

CCEE 498	**Special Topics in Computer & Communication Engineering**	**3(3,0)**
This course is designed to enable students to study current special topics of interest that are carefully selected from CCE-related topics. The contents of such a course are to be determined by the instructor and the department.		

CCEE 511	**Mobile Application Development**	**3(3,0)**
Today's applications are increasingly mobile. Computers are no longer confined to desks and laps but instead live in our pockets and hands. This course teaches students how to build mobile apps for Android and iOS, two of today's most popular platforms, and how to deploy them in Android Market and the App store. Students learn how to write native apps for Android using Eclipse and the Android SDK, how to write native apps for iPhones, iPod touches, and iPad using xcode and the iOS SDK, and how to write web apps for both platforms. **Prerequisite:** CCEE 214. Equivalent to COSC 435.		

CCEE 513	**Operating Systems**	**3(3,0)**
This course covers operating systems principles, scheduling and resource management, virtual memory, file systems, concurrent processing and synchronization, security, and protections; the Internet, network structures, distributed operating systems, Web technologies and operating systems (URL, HTML, HTTP,		

applets). A case study of a UNIX operating system is covered during the course. **Prerequisite**: CCEE 214. Equivalent to COSC 451.

CCEE 514	Advanced Web Programming	3(3,0)
This course focuses on server-side programming. It allows students to get to know how to connect their website or web application to a database, and how to save and retrieve data from that database. The course exposes students to web controls, validation controls, data source controls, data bind controls, state management, as well as working with a third-party medium like XML and web services. **Prerequisite**: CCEE 411/COSC 333. Equivalent to COSC 434.		

CCEE 515	Distributed Computing	3(3,0)
This course will introduce students to the challenges faced in constructing parallel and distributed applications, including testing, debugging and performance evaluation. The student will be trained in various implementation techniques, paradigms, architectures and programming languages. **Prerequisite**: CCEE 528 or equivalent.		

CCEE 516	Advanced Programming and Database Management Systems	3(2,2)
This course will introduce students to managing their own databases and query them, and to managing Data Warehousing. Students will also learn advanced programming tools including bigtable, NoSQL, R, Python, SCALA, mapreduce, ElasticSearch and apply these tools to address big data issues. **Prerequisite**: CCEE 315 or equivalent.		

CCEE 520	Parallel Processing	3(3,0)
This course introduces the student to various aspects of parallel processing including parallel architectures, algorithms, systems, programming languages and implementation. Students will be expected to work with recent existing parallel machines, and design and implement parallel processing projects. **Prerequisite**: CCEE 221.		

CCEE 521	Hardware-Software Co-Design	3(3,0)
This course introduces the student to the design of complex embedded systems. Several different models and methods are presented that will help the student design software and hardware components which work together. Models to describe hardware and software components are introduced (specifications). Then hardware-software partitioning and design space exploration are introduced as part of the system design. Performance analysis and estimation techniques are then explained. Finally, a current hardware-software co-design topic is chosen and introduced. Students will be expected to design and implement a project using the information in this course. **Prerequisite**: CCEE 221.		

CCEE 535	Digital Signal Processing	3(3,0)
This course focuses on digital signal processing (DSP) and its application. It allows students to understand how digital signal processing can be used in operational		

systems. Students are required to develop simulations of the learned concepts using MATLAB. Specific topics covered include Review of mathematical tools used in DSP, digital filter structure, digital filter design, simple DSP algorithm implementation, spectral analysis of signals. **Prerequisite**: CCEE 331.

CCEE 536	Digital Image Processing	3(3,0)
Two-dimensional signals and systems. Image formation and perception. Representation, coding, filtering restoration and enhancements. Feature extraction and scene analysis. Introduction to computer vision. Introduction to Medical Imaging. **Prerequisite:** CCEE 331 or Equivalent.		

CCEE 540	Satellite Communication Systems	3(3,0)
This course focuses on satellite technology fundamentals. Topics include history of satellites, satellite missions and applications, study of orbits and trajectories of satellites, satellite launch and in-orbit operations, satellite link fundamentals, satellite hardware, Communication Satellites, GPS, and Direct Broadcast Satellites. **Prerequisite**: CCEE 447.		

CCEE 542	Microwave Communications	3(3,0)
This course introduces the fundamental principles of microwave circuit analysis and design. Topics include review of electromagnetic theory, Transmission Line Theory, Impedance Matching and Tuning, Microwave Network Analysis, Power Dividers, and Microwave Propagation. This course also includes some laboratory experiments on microwave circuits. **Prerequisite**: ELEC 340.		

CCEE 545	Advanced Mobile Communications	3(3,0)
This course seeks to provide insight into the development of the latest generations of mobile networks. In this course, we will focus mainly on LTE and LTE-Advanced (LTE-A): Motivation, architecture, air interface, radio procedures, QoS, and planning. In addition, we will briefly discuss 5G networks and Internet of Things. **Co-requisite**: CCEE 449.		

CCEE 546	Array Processing	3(3,0)
This course includes Mono- and Multi-Antenna Concept introduction: multi-antenna benefits; beam forming techniques; adaptive antennas; MIMO systems: diversity/multiplexing tradeoff, multi-antenna transmission techniques (Alamouti and spatio-temporal techniques), multi-antenna reception techniques, transmission strategies; applications (MIMO in 3G and LTE). **Prerequisite**: CCEE 444.		

CCEE 547	Optical Communications	3(3,0)
This course is designed to progress from the description of the components in a fiber link to the interconnections into a link or a network. The components in fiber links will be discussed (the fiber, the connections, the sources and receivers). These optical components will be integrated together in a complete optical link. **Prerequisite**: CCEE 331.		

CCEE 552	Network Security	3(3,0)
Network security is the protection of the underlying networking infrastructure from unauthorized access, misuse, or theft. It involves creating a secure infrastructure for devices, applications, users, and applications to work in a secure manner. **Pre-requisite**: CCEE 454 or COSC 360.		

CCEE 553	Advanced Communication Networks	3(3,0)
In this course we will explore current network architectures and topologies such as: telephone systems (PDH/SDH, SONET), Frame Relay, ATM, and MPLS networks, in addition to the technologies under development. We will also learn how to assess network performance and what are the technologies used to enhance the quality of provided services. At the end of the course, the student will be able to identify the technologies to be used in a given environment and study its performance. **Prerequisite**: CCEE 354.		

CCEE 554L	Computer Networks Lab 2	1(0,2)
This Lab helps prepare students seeking to pass Cisco - Routing and Switching Essentials (CCNA 2) Certifications. The primary focus of this Lab is routers and switches in small networks. The student will learn the architecture, components, and operations of routers and switches, in addition to their configuration with basic functionalities. They will also learn how to configure and troubleshoot static and dynamic routing protocols, access control lists, VLAN, DHCP for IPv4 and IPv6 networks, and NAT operations. **Co-requisite**: CCEE 354L.		

CCEE 555	Advanced Computer Networks	3(3,0)
This is an advanced networking course that requires active student participation. In this course, we will explore TCP protocol, Internet inter-domain routing, Internet QoS and traffic engineering, Internet traffic measurement and analysis, data centers, analysis and performance of content distribution networks, and Software-defined networking. In addition, the student will learn how to build client/server computer network applications using sockets. **Prerequisite**: CCEE 354.		

CCEE 555L	Computer Networks Lab 3	1(0,2)
This Lab helps prepare students seeking to pass Cisco - Routing and Switching Essentials (CCNA 3) Certifications. The primary focus of this Lab is routers and switches in large and complex networks. The student will learn how to configure routers and switches with advanced functionalities. They will also learn how to configure and troubleshoot enhanced switching technologies, first hop redundancy protocol in a switched network, wireless routers and clients, and routers in complex networks. Finally, they will learn how to manage CISCO IOS software licensing and configuration files. **Prerequisite**: CCEE 554L.		

CCEE 556	Network and System Administration	3(3,0)
This course will help students to become system administrators and be able to install, configure, maintain, and troubleshoot a Microsoft Windows Server Operating system.		

It provides them with the knowledge and skills to work with Active Directory technologies in environments including complex network services. This course also gives the students basic knowledge on the installation, configuration and maintenance of Linux operating systems. At the end of this course, students will have all the required materials to submit and pass the MCSA: windows server certification. **Prerequisite**: CCEE 354.

CCEE 556L	**Computer Networks Lab 4**	**1(0,2)**
This Lab helps prepare students seeking to pass Cisco – Connecting Networks (CCNA 4) Certifications. The primary focus of this Lab is Wide Area Network (WAN) technologies and the services provided by complex networks to support converged applications. The student will learn how to configure and troubleshoot routers for WAN, NATing for IPv4 network, serial, and broadband connections, tunneling operations, and monitoring Site-to-site connectivity with highlight on security. They will also learn how to configure and troubleshoot network management operations using syslog, SNMP, and Netflow. Finally, they will understand virtual private network (VPN) benefit and operations, borderless networks' architecture, data centers and virtualization architecture, and collaboration technologies and solution. **Co-requisite**: CCEE 555L.		

CCEE 561	**Computer Vision**	**3(3,0)**
This course introduces the principles, models, and applications of computer vision. The course will cover image structure, projection, stereo vision, and the interpretation of visual motion. Case studies of industrial (robotic) applications of computer vision, including visual navigation for autonomous robots, robot hand-eye coordination and novel man-machine interfaces. **Prerequisite**: CCEE 214 or COSC 214.		

CCEE 563	**Robotics**	**3(3,0)**
Introductory historical development of robotics; rigid objects Kinematics; robot arm kinematics; inverse kinematics; dynamics; introduction of trajectory planning and control of manipulators. **Prerequisite**: MATH 311 and MATH 314. Equivalent to MECA 524.		

CCEE 566	**Natural Language Processing**	**3(3,0)**
This course introduces the student to the area of natural language processing (NLP). The student is first introduced to word and sentence tokenization. The student then uses the learned skills to implement systems for text classification and sentiment analysis, spelling correction, information extraction, parsing, meaning extraction, and question answering, Machine learning algorithms as well as algorithms like n-gram language modeling, naive bayes and maxent classifiers, sequence models like Hidden Markov Models, probabilistic dependency and constituent parsing, and vector-space models of meaning will be introduced as needed for the above NLP applications. **Prerequisite**: CCEE 214 or COSC 214 or Equivalent.		

CCEE 567	Optimization	3(3,0)
This course introduces students to the theory, algorithms, and applications of optimization. The optimization methodologies include linear programming, network optimization, integer programming, and decision trees. It Includes a team project in which students select and solve a problem in practice. **Prerequisite**: Math 211 or equivalent. Equivalent to: BADM 420 and MECH 571.		

CCEE 568	Big Data and Analytics/Big Data System	3(3,0)
This course enables students to understand why the Big Data Era has come to be. Students will become conversant with the terminology and the core concepts behind big data problems, applications, and systems. Students will learn how to make Big Data useful in their business or career. Students will be introduced to one of the most common frameworks, Hadoop, that has made big data analysis easier and more accessible -- increasing the potential for data to transform our world. **Prerequisite**: CCEE 564 or equivalent.		

CCEE 597	Advanced Topics in Computer & Communications Engineering	3(3,0)
This course is designed to enable students to study a given advanced topic of interest, which is carefully selected from the CCE engineering-related topics. The content outline of such a topic is to be determined by the instructor and to be approved by the department. **Prerequisite**: Instructor's consent.		

MINOR IN ARTIFICIAL INTELLIGENCE

Rationale

The College of Engineering/ECE department offers a minor in Artificial Intelligence (AI). The minor aims to address the expected national, regional, and international need for experts in Artificial Intelligence, Knowledge Representation, Data Mining, Machine Learning and Automated Reasoning.

Minor Objectives

The aims of the minor are to:
1. Provide students with advanced expertise in AI.
2. Prepare students to apply AI in industry.
3. Prepare students for graduate studies in AI.

Learning Outcomes

At the end of this minor, the student is expected to demonstrate ability to:
1. Use current techniques, architectures, and tools to build intelligent systems.
2. Design systems and tools to evaluate the performance of intelligent systems.
3. Apply AI tools and techniques to improve the performance of exiting non-AI enabled systems.

Minor Requirements

While most relevant to students from Computer and Communications Engineering and Computer Science, this minor is offered to undergraduate RHU students in the BE or MS program, from different disciplines (Engineering and Computer Science). It may also be offered to students with a BS/BE from other universities subject to a case-by-case evaluation of their transcripts and other specific RHU requirements.

Early in their major, interested RHU engineering students need to fill in the appropriate form declaring that they will be minoring in AI while completing their regular major.

To successfully complete the AI minor, a student must:
1. Declare a minor in Artificial Intelligence by completing the Minor Declaration Form.
2. Obtain the approval of the dean of the student's college and the dean of the College of Engineering.
3. Earn a Minor Cumulative Grade Point Average of no less than 70 %.
4. Complete 18 credits of coursework as specified below.

It should be noted that overlap in courses between student major requirements or any other minor requirements and AI minor requirements are counted to fulfill the minor

requirements. The student must complete a minimum of 3 credit hours of coursework that are not counted toward the requirement for his/her major or any other minor.

Career Options

This minor allows its holders to seek careers in a variety of sectors no matter the student's major. These sectors include, but are not limited to communications, computers, computer networks, environmental engineering, energy, smart cities, autonomous vehicles, biomedical engineering, health, security, biology, and physics.

Curriculum and Program

The Artificial Intelligence minor consists of six courses (18 credits) in which two are mandatory and four are electives selected to satisfy the requirements of the proposed program objectives and learning outcomes.

Mandatory Courses

The three mandatory courses (9 credits) are:

CCEE 460	Artificial Intelligence	3(3,0)
CCEE 564	Machine Learning and Data Mining	3(3,0)

Elective Courses

Students may choose three elective courses (9 credits) from the following list.

CCEE 516	Advanced Programming and Database Management Systems	3(2,2)
CCEE 536	Digital Image Processing	3(3,0)
CCEE 561	Computer Vision	3(3,0)
CCEE 566	Natural Language Processing	3(3,0)
CCEE 567	Optimization	3(3,0)
CCEE 568	Big Data and Analytics/Big Data Systems	3(3,0)
CCEE 612	Advanced Data Mining	3(3,0)

Courses Description

CCEE 460	**Artificial Intelligence**	**3(3,0)**
This course introduces students to the basic knowledge representation and learning methods of artificial intelligence. The emphasis will be on understanding the fundamental artificial intelligence concepts, as well as being able to practically apply the corresponding approaches in solving practical problems and developing useful software applications. Covered topics include intelligent agents, informed and		

uninformed search strategies, and adversarial search. The Python language libraries will also be introduced **Prerequisite**: CCEE 214 or equivalent.

CCEE 516	Advanced Programming and Database Management Systems	3(2,2)
This course will introduce students to managing their own databases and query them, and to managing Data Warehousing. Students will also learn advanced programming tools including bigtable, NoSQL, R, Python, SCALA, mapreduce, ElasticSearch and apply these tools to address big data issues. **Prerequisite**: CCEE 315 or equivalent.		

CCEE 536	Digital Image Processing	3(2,2)
Two-dimensional signals and systems. Image formation and perception. Representation, coding, filtering restoration and enhancements. Feature extraction and scene analysis. Introduction to computer vision. Introduction to Medical Imaging. **Prerequisite**: CCEE 214		

CCEE 561	Computer Vision	3(3,0)
This course introduces the principles, models, and applications of computer vision. The course will cover image structure, projection, stereo vision, and the interpretation of visual motion. Case studies of industrial (robotic) applications of computer vision, including visual navigation for autonomous robots, robot hand-eye coordination and novel man-machine interfaces. **Prerequisite**: CCEE 214 or COSC 214.		

CCEE 563	Robotics	3(3,0)
Introductory historical development of robotics; rigid objects Kinematics; robot arm kinematics; inverse kinematics; dynamics; introduction of trajectory planning and control of manipulators. **Equivalent to**: MECA 544. **Prerequisite**: None		

CCEE 564	Machine Learning and Data Mining	3(3,0)
This course introduces students to the basic knowledge representation and learning techniques. The emphasis consists of understanding the data mining process, as well as being able to practically apply the corresponding approaches in solving practical problems and developing intelligent software applications. The course covers several topics that lie with classification, prediction, and clustering. **Prerequisite:** CCEE 214		

CCEE 566	Natural Language Processing	3(3,0)
This course introduces the student to the area of natural language processing (NLP). The student is first introduced to word and sentence tokenization. The student then uses the learned skills to implement systems for text classification and sentiment analysis, spelling correction, information extraction, parsing, meaning extraction, and question answering, Machine learning algorithms as well as algorithms like n-gram language modeling, naive bayes and maxent classifiers, sequence models like Hidden Markov Models, probabilistic dependency and constituent parsing, and vector-space models of meaning will be introduced as needed for the above NLP applications. **Prerequisite**: CCEE 214		

CCEE 567	Optimization	3(3,0)
This course introduces students to the theory, algorithms, and applications of optimization. The optimization methodologies include linear programming, network optimization, integer programming, and decision trees. It Includes a team project in which students select and solve a problem in practice. **Equivalent to**: BADM 420 and MECH 571. **Prerequisite**: Math 211 or equivalent.		

CCEE 568	Big Data and Analytics/Big Data System	3(3,0)
This course enables students to understand why the Big Data Era has come to be. Students will become conversant with the terminology and the core concepts behind big data problems, applications, and systems. Students will learn how to make Big Data useful in their business or career. Students will be introduced to one of the most common frameworks, Hadoop, that has made big data analysis easier and more accessible -- increasing the potential for data to transform our world. **Prerequisite**: CCEE 564 or equivalent.		

Minor in Computer Networks

Rationale

In today's world, we cannot imagine a company without computer networks. Therefore, networking skills are becoming a value added for any employee from any domain.

In response to national, regional, and international needs and demand for experts in computer networks, the College of Engineering/ECE department and the College of Arts and Sciences/CS Department offer a minor in Computer Networking.

Program's Purpose

The main aim of the minor is to expose students from different background to the concepts of computer networks, and the protocols that allow devices and systems to communicate. It will equip them with the necessary knowledge and skills needed to install and operates networks at different scales. Furthermore, the minor will allow students to acquire CISCO CCNA routing and switching certification. The minor shall also serve as good preparation for further and more advanced graduate and/or professional studies in computer networks.

Learning Outcomes

At the end of this minor, the student is expected to demonstrate ability to:

- Compare different computer networks protocols;
- Design simple computer networks;
- Perform simple computer networks troubleshooting;
- Investigate simple computer networks attacks.

Minor Requirements

This minor is structured to accommodate undergraduate RHU students in the BE or BS program from different disciplines (engineering, computer science, or business). It may also be offered to students with a BS/BE from other universities subject to a case-by-case evaluation of their transcripts and other specific RHU requirements.

Early in their studies, interested RHU students need to declare their intention to seek a minor in computer networks by filling out the pertinent minor declaration form and informing their advisor.

To successfully complete the computer networking minor, a student must

1. Declare a minor in computer networks by completing the Minor Declaration Form;
2. Obtain the approval of the Dean of the student's college major and the Dean of the College of Engineering;

3. Earn a Minor Cumulative Grade Point Average (MCGPA) of no less than 70%;
4. Complete 19 credits of coursework as specified below.

It should be noted that common courses between student major requirements and computer networks minor requirements are counted to fulfill the minor requirements. The student must complete a minimum of 3 credit hours of coursework that are not counted toward the requirement for his/her major or any other minor.

Career Options

Computer networks experts are well suited to work in a variety of sectors including, but not limited to, telecommunications, hospitals, banks, police, army, etc.

Curriculum and Program

The computer networking minor consists of 5 courses and 4 labs (19 credits) in which 7 credits are mandatory and the remaining credits are elective, selected to satisfy the requirements of the proposed program objectives and learning outcomes.

Mandatory Courses

The mandatory courses (7 credits) are:

CCEE 354	Computer Networks	3(3,0)
CCEE 354L	Computer Networks Lab	1(0,2)
CCEE 554L	Computer Networks Lab 2	1(0,2)
CCEE 555L	Computer Networks Lab 3	1(0,2)
CCEE 556L	Computer Networks Lab 4	1(0,2)

Elective Courses

Students may choose elective courses (12 credits) from the following list.

CCEE 411	Web Programming	3(3,0)
CCEE 514	Advanced Web Programming	3(3,0)
CCEE 547	Optical Communications	3(3,0)
CCEE 552	Network Security	3(3,0)
CCEE 553	Advanced Communication Networks	3(3,0)
CCEE 555	Advanced Computer Networks	3(3,0)
CCEE 556	Network and System Administration	3(3,0)

Courses Description

CCEE 411	Web Programming	3(3,0)
This course teaches students how to develop and implement web-based programs with emphasis on interface programming. It introduces students to web development and to different client and server-side languages and styles needed to develop adequate and responsive websites. The course covers HTML5, CSS3, JavaScript/jQuery, PHP, and responsive design. **Co-requisite:** CCEE 214. Equivalent to COSC 333.		

CCEE 354	Computer Networks	3(3,0)
This course enables students to gain fundamental knowledge of computer networks, appreciate various tradeoffs and choices in networking, learn to design and analyze protocols, and get ready for studying advanced topics in the field of networks. **Co-requisite**: CCEE 221. Equivalent to COSC 360.		

CCEE 354L	Computer Networks Lab	1(0,2)
This Lab helps prepare students seeking to pass advanced Cisco Certifications. The student will acquire the knowledge of the functionalities of network equipment and protocols, learn how to build a simple Ethernet network using routers, switches and computers, and use router CLI commands to perform basic configuration and verification. The student will also learn valuable network problem solving techniques and concepts. Accompanying Lab for CCEE 354. **Co-requisite**: CCEE 354.		

CCEE 514	Advanced Web Programming	3(3,0)
This course focuses on server-side programming. It allows students to get to know how to connect their website or web application to a database, and how to save and retrieve data from that database. The course exposes students to web controls, validation controls, data source controls, data bind controls, state management, as well as working with a third-party medium like XML and web services. **Prerequisite**: CCEE 411/COSC 333. Equivalent to COSC 434.		

CCEE 547	Optical Communications	3(3,0)
This course is designed to progress from the description of the components in a fiber link to the interconnections into a link or a network. The components in fiber links will be discussed (the fiber, the connections, the sources and receivers). These optical components will be integrated together in a complete optical link. **Prerequisite**: CCEE 331.		

CCEE 552	Network Security	3(3,0)
Network security is the protection of the underlying networking infrastructure from unauthorized access, misuse, or theft. It involves creating a secure infrastructure for devices, applications, users, and applications to work in a secure manner. **Pre-requisite**: CCEE 454 or COSC 360.		

CCEE 553	Advanced Communication Networks	3(3,0)
In this course we will explore current network architectures and topologies such as: telephone systems (PDH/SDH, SONET), Frame Relay, ATM, and MPLS networks, in addition to the technologies under development. We will also learn how to assess network performance and what are the technologies used to enhance the quality of provided services. At the end of the course, the student will be able to identify the technologies to be used in a given environment and study its performance. **Prerequisite**: CCEE 354.		

CCEE 554L	Computer Networks Lab 2	1(0,2)
This Lab helps prepare students seeking to pass Cisco - Routing and Switching Essentials (CCNA 2) Certifications. The primary focus of this Lab is routers and switches in small networks. The student will learn the architecture, components, and operations of routers and switches, in addition to their configuration with basic functionalities. They will also learn how to configure and troubleshoot static and dynamic routing protocols, access control lists, VLAN, DHCP for IPv4 and IPv6 networks, and NAT operations. **Co-requisite**: CCEE 354L.		

CCEE 555	Advanced Computer Networks	1(0,2)
This is an advanced computer networks course that requires active student participation. In this course, we will explore TCP protocol, Internet inter-domain routing, Internet QoS and traffic engineering, Internet traffic measurement and analysis, data centers, analysis and performance of content distribution networks, and Software-defined networking. In addition, the students will learn how to build client/server computer network applications using sockets. **Prerequisite**: CCEE 354.		

CCEE 555L	Computer Networks Lab 3	1(0,2)
This Lab helps prepare students seeking to pass Cisco - Routing and Switching Essentials (CCNA 3) Certifications. The primary focus of this Lab is routers and switches in large and complex networks. The student will learn how to configure routers and switches with advanced functionalities. They will also learn how to configure and troubleshoot enhanced switching technologies, first hop redundancy protocol in a switched network, wireless routers and clients, and routers in complex networks. Finally, they will learn how to manage CISCO IOS software licensing and configuration files. **Prerequisite**: CCEE 554L.		

CCEE 556	Network and System Administration	3(3,0)
This course will help students to become system administrators and be able to install, configure, maintain and troubleshoot a Microsoft Windows Server Operating system. It provides them with the knowledge and skills to work with Active Directory technologies in environments including complex network services. This course also gives the students basic knowledge on the installation, configuration, and maintenance of Linux operation systems. At the end of this course, students will have all the required materials to submit and pass the MCSA: windows server certification. **Prerequisite**: CCEE 354.		

CCEE 556L	Computer Networks Lab 4	1(0,2)
This Lab helps prepare students seeking to pass Cisco – Connecting Networks (CCNA 4) Certifications. The primary focus of this Lab is Wide Area Network (WAN) technologies and the services provided by complex networks to support converged applications. The student will learn how to configure and troubleshoot routers for WAN, NATing for IPv4 network, serial and broadband connections, tunneling operations, and monitoring Site-to-site connectivity with highlight on security. They will also learn how to configure and troubleshoot network management operations using syslog, SNMP, and Netflow. Finally, they will understand virtual private network (VPN) benefit and operations, borderless networks' architecture, data centers and virtualization architecture, and collaboration technologies and solution. **Co-requisite**: CCEE 555L.		

BIOMEDICAL ENGINEERING PROGRAM

Mission

The program aims to help students to explore their innate creativity and potential and endow them with the knowledge, skills and abilities to: pursue successful careers in the biomedical/clinical engineering and subsequent fields; think critically in solving health-care related complex problems using modern tools and technologies; communicate and work effectively with diverse groups; learn more every day, and succeed in graduate studies in renowned institutions if they choose to.

Objectives

The program educational objectives are to enable students to:

1. Foster an environment that encourages excellence in endeavor.
2. Provide quality and professional education which prepares leaders.
3. Solve problems facing the society and industry in Lebanon, the Middle East, and the world.
4. Engage in multidisciplinary research.

Program Learning Outcomes

The Electrical Engineering program adopts the learning outcomes of ABET so our graduates will have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. an ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions.

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Accreditation

The Bachelor of Engineering program in Biomedical Engineering is accredited by the Engineering Accreditation Commission (EAC) of **ABET**, 415 North Charles Street, Baltimore, MD 21201; www.abet.org.

Career Opportunities

Biomedical engineering reflects a multi-disciplinary career profile relying on knowledge in different fields of science, instrumentation, and design. Our program graduates will act as the technology entrepreneur capable of interacting with health care professionals.

Biomedical engineers develop tools and machines to improve human health and ensure proper diagnostic procedures. Biomedical courses and laboratories teach how to perform well in advanced therapeutic and surgical devices, medical imaging, artificial organs, physiological modeling, rehabilitation engineering, Bio-robotics, and management of medical equipment.

Biomedical engineering is the fastest-growing career, a trend that is expected to continue over the next decade.

Program Overview

The Biomedical (BIOM) Engineering Program at Rafik Hariri University puts the best of students' interest, first and foremost. Every little experience the student attains represents a block in the building of a competent, confident, purposeful, problem solving, competitive, responsible, and conscientious individual. This is accomplished by means of a curriculum and facilities that conform to the highest of standards, faculty members committed to the academic and personal growth of the student, and an environment that inspires learning and drives creativity.

The Bachelor of Engineering (BE) degree in the BIOM Engineering program encompasses 147 credit hours spread over eight regular semesters and three summer semesters. The Bachelor of Science (BS) degree's curriculum comprises a total of 114 credit hours spread over six regular semesters and three summer semesters. In addition to completing the credits requirements, a BS or a BE degree is conferred upon a student if the earned Cumulative GPA, Major PGA and the Summative Learning Project grade are all 70 or above.

The required credit hours span three categories: General Education requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours for the BS and BE programs are shown in the following table:

BS in BIOM Engineering (114 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education Requirement	0	0	22	6	28	24
College Requirement	0	0	22	3	25	22
Program Requirement	31	0	30	0	61	54
Credits	31	0	74	9	114	100
BE in BIOM Engineering (147 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	0	0	22	9	31	21
College Requirement	0	0	25	3	28	19
Program Requirement	41	15	32	0	88	60
Credits	41	15	79	12	147	100

I. General Education Requirements

The list of the GE required courses and their descriptions are presented in the introductory pages of the College of Engineering section in this catalog.

II. College Requirements

The list of the College required courses and their descriptions are presented in the introductory pages of the College of Engineering section in this catalog.

III. Program Requirements

The program requirements for a Bachelor of Engineering degree in BIOM Engineering encompass 86 credits (59 credits for the BS degree) distributed as follows: 71 credits (59 credits for the BS degree) Mandatory courses and 15 credits technical engineering elective courses for BE only.

A. Mandatory Requirements

The BIOM mandatory core courses (major and non-major) are listed in the table below.

Course #	Title	Credits	Prerequisites
BIOM 301+301L	Biomedical Sensors + Lab	4	

BIOM 311	Biomedical Instrumentation	3	BIOM 301 ELEC 210
BIOM 312+312L	Biomedical Engineering Design I & Lab	4	BIOM 301 ELEC 210
BIOM 400*	BS Summative Learning Project	3	
BIOM 413	Bio-electronics Circuit Design	3	BIOM 301, Co-req.: ELEC 320
BIOM 414	Advanced Biomedical Instrumentation	3	BIOM 311
BIOM 415L	Advanced Biomedical Lab	1	BIOM 414
BIOM 416	Clinical Laboratory Instruments	3	BIOM 311
BIOM 417	Critical Equipment	3	BIOM 311
BIOM 421	Medical Imaging	3	PHYS 312
BIOM 499	Co-op Work Experience	1	ENGL 217; Senior Standing
BIOM 519	Advanced Therapeutic Devices	3	BIOM 414
BIOM 522	Advanced Medical imaging	3	BIOM 421
BIOM 531	Clinical Engineering	3	BIOM 417 and BIOM 421
BIOM 595A	BE Summative Learning Project 1	1	
BIOM 595B	BE Summative Learning Project 2	3	
BIOM xxx	Technical Electives	15	Per course requirements
CCEE 221+221L	Logic Design and Lab	4	
CCEE 331	Signals and Systems	3	MATH 211
CCEE 426+426L	Design of Embedded Systems & Lab	4	CCEE 221
CCEE 534	Signal Processing	3	CCEE 331
CIVE 211	Statics	3	
ELEC 200	Introduction to Electric and Computer Engineering	3	
ELEC 320+320L	Electronics and Lab	4	ELEC 210
ELEC 340	Engineering Electromagnetics	3	PHYS 211
ELEC 341 + 341L	Measurements & instrumentation & Lab	4	ELEC 320
ELEC 451	Control Systems	3	CCEE 331

* Required for BS bound students. BE students take engineering technical elective instead.

B. Technical Electives

As part of the program for the Bachelor of Engineering in BIOM Engineering, the student is required to study 12 credit hours of technical elective courses. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. The student can also mix and match engineering technical elective courses from the different areas to get a more general exposure to the different BIOM Engineering disciplines. The student should select, in cooperation with the academic advisor, the list of electives that best meet his or her needs and aspirations. The listed engineering technical elective

courses and other courses from other engineering programs, in addition to the required program courses, are designed to allow the student to develop in-depth knowledge and understanding in the following areas:

1. Medical Instrumentation
2. Medical Imaging
3. Clinical Engineering
4. Artificial organs

It is highly recommended that the student takes engineering technical elective courses from the list below after completing the mandatory requirements in the related area. Students may select engineering technical electives from other programs subject to approval of the academic advisor and the corresponding course instructor.

Course #	Title	Credits	Prerequisites
BIOM 402	Radio Frequency Applications in Biomedical Engineering	3	CCEE 331
BIOM 498	Special Topics in Biomedical Engineering	3	
BIOM 501	Emerging Healthcare Technologies	3	
BIOM 502	AI Applications in Healthcare	3	
BIOM 503	Computational Neuroscience	3	
BIOM 504	Bio-Image Processing	3	CCEE 331
BIOM 505	Computer Simulations for Life Sciences	3	
BIOM 506	Biomaterials	3	BIOM 311
BIOM 507	Bio-fluids	3	
BIOM 508	Microcontroller and Embedded Systems for Biomedicine	3	CCEE 426
BIOM 512	Biomechanics and Rehabilitation Engineering	3	CIVE 211 BIOM 311
BIOM 513	Hemodynamics Measurement	3	
BIOM 521	Introduction to E-Healthcare	3	BIOM 421
BIOM 532	Biomedical Servicing	3	
BIOM 533	Health-care Facility Management	3	
BIOM 597	Advanced Topics in Biomedical Engineering	3	Senior Standing

C. Summative Learning Project

Students must complete a 3- credit hours course for BS (3-credits for BE; taken 2 credit in the first regular semester and 3 credits in the following regular semester) in which they work, preferably in groups, on a problem of concern to industry or the community at large, or to innovate a promising idea. The SLP could be an extension of the projects students had worked on in the previous courses to bring it to a more useful outcome.

D. Co-op Experience

Students must complete 8 weeks of practical training working in an area related to their field of interest. The Co-op experience is usually fulfilled during the summer semester of the third year into the program. The Co-op office matches the Co-op assignment with the

student's field of study and employer's interest. A faculty member follows up on the student's progress throughout the Co-op period by conducting field visits and ensuring that the student's performance is aligned with his/her aspirations and employer's needs. Students are required to submit a formal report, a poster and make a formal presentation about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to stipulate additional conditions.

Course Coding

The courses offered in the BIOM Engineering program are designated code numbers in the form of (BIOM abc) where:

a	Designates year (level)
b	Designates focus areas (as follows) 0: General Biomedical courses; 1: Medical Instrumentation; 2: Medical Imaging; 3: Clinical Engineering
c	Designates course sequence in a focus area

Study Plan

The following study plan summarizes the courses and credits distribution for the Bachelor of Science (BS) and Bachelor of Engineering (BE) in BIOM Engineering. The study plan serves as a roadmap to facilitate student's smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Fall Semester (16 Credits)			
CCEE 214	Introduction to Programming	3	
ENGL 210	English Composition and Rhetoric	3	Placement
ELEC 200	Introduction to Electrical & Computer Engineering	3	
MATH 211	Calculus III	4	
PHYS 211	Physics: Electricity and Magnetism & Lab	3	
Year 1, Spring Semester (15 Credits)			
CCEE 221	Logic Design	3	
ELEC 210	Electric Circuits	3	PHYS 191 or Equivalent
MATH 311	Linear Algebra and Applications	3	
CIVE 211	Statics	3	MATH 211
	Social Science Elective	3	
Year 1, Summer Semester (10 Credits)			
CCEE 221L	Logic Design Lab	1	Co-req.: CCEE 221
MATH 351	Probability and Statistics	3	MATH 211

BIOL 210	Human Anatomy and Physiology	3	
	Social Science Elective	3	
Year 2, Fall Semester (17 Credits)			
ARAB 212	Arabic Language & Communication	2	
BIOM 301	Biomedical Sensors	3	
BIOM 301L	Biomedical Sensors Lab	1	Co-req.: BIOM 301
CCEE 331	Signals and Systems	3	MATH 211
CMNS 200	Etiquette	1	Co-req.: ENGL 210
ELEC 320	Electronics	3	ELEC 210
ELEC 320L	Electronics Lab	1	Co-req.: ELEC 320
ENGL 217	Professional English	3	ENGL 210
Year 2, Spring Semester (17 Credits)			
BIOM 311	Biomedical Instrumentation	3	BIOM 301 ELEC 210
BIOM 312	Biomedical Engineering Design I	3	BIOM 301
BIOM 312L	Biomedical Engineering Design Lab I	1	Co-req.: BIOM 312
ELEC 340	Engineering Electromagnetics	3	PHYS 211
ELEC 341	Measurements and Instrumentation	3	ELEC 320
ELEC 341L	Measurements and Instrumentation Lab	1	Co-req.: ELEC 341
MATH 314	Ordinary Differential Equations	3	MATH 211
Year 2, Summer Semester (6 Credits)			
ENGR 300	Engineering Economics and Management	3	
MATH 210/ MATH 421	Discrete Math/Numerical Analysis	3	MATH 311
Year 3, Fall Semester (16 Credits)			
BIOM 413	Bio-electronics Circuit Design	3	BIOM 301, Co-req.: ELEC 320
BIOM 414	Advanced Biomedical Instrumentation	3	BIOM 311
BIOM 417	Critical Care Equipment	3	BIOM 311
CCEE 426	Design of Embedded Systems	3	CCEE 221
CCEE 426L	Design of Embedded Systems Lab	1	Co-req.: CCEE 426
ELEC 451	Control Systems	3	CCEE 331
Year 3, Spring Semester (16 Credits)			
BIOM 415L	Advanced Biomedical Lab	1	BIOM 414
BIOM 416	Clinical Laboratory Equipment	3	BIOM 311
BIOM 421	Medical Imaging	3	PHYS 312
	Engineering Technical Elective 1*	3	
	Humanities Elective	3	
	Science Elective	3	
Year 3, Summer Semester (1 Credit)			
BIOM 499	Co-op Work Experience	1	ENGL 217
The above 114 credits complete the requirements for a Bachelor of Science degree in Biomedical Engineering			

Year 4, Fall Semester (16 Credits)			
BIOM 519	Advanced Therapeutic Devices	3	BIOM 414
BIOM 522	Advanced Medical Imaging	3	BIOM 421
BIOM 595A	BE Summative Learning Project 1	1	ENGL 217
CCEE 534	Signal Processing	3	CCEE 331
ENGR 510	Engineering Project Management	3	ENGR 300
	Engineering Technical Elective 2	3	
Year 4, Spring Semester (17 Credits)			
BIOM 531	Clinical Engineering	3	BIOM 417 BIOM 421
BIOM 595B	BE Summative Learning Project 2	2	BIOM 595A
	Engineering Technical Elective 3	3	
	Engineering Technical Elective 4	3	
	Engineering Technical Elective 5	3	
	Social Sciences/ Humanities Elective II	3	
Total BE credits: 147			

* BS bound students are required to take BIOM 400 – Summative Learning (BS) Project instead.

Note: Engineering Technical Electives (levels 400 or above) are selected as such:
6 credits restricted Departmental Electives
9 credits from any Engineering discipline of levels 400 or above.

Courses Description

I. Mandatory Courses

Non-Major Courses

Description of the non-major mandatory courses follows.

BIOL 210	**Human Anatomy and Physiology and Lab**	**3(2,2)**
A general overview that deals with cell structure and function and physiology, anatomy and physiology of the human body systems. These include cardiovascular, central nervous, respiratory, urinary, digestive, immune, and musculoskeletal systems. The course also offers a set of experiments that deal with basic biological processes and advanced biological assessments. **Prerequisite**: None.		

CCEE 214	**Programming**	**3(2,2)**
Understanding of the basic principles of programming and computer systems; Applications of programming to the solution of engineering problems; Control structures, functions, arrays, pointers and structures.		

CCEE 221	**Logic Design**	**3(3,0)**
This course addresses Boolean algebra and logic simplification techniques, data representation, and the design of combinational logic networks for decoders, encoders, multiplexers, and demultiplexers. Design of sequential logic devices		

including flip-flops, registers, and counters, as well as analysis of devices used to build logic networks, including programmable logic devices.

CCEE 221L	Logic Design Lab	1(0,2)
This Lab covers design techniques and implementation of combinational and sequential logic circuits. Experiments include logic gates, design and implementation of logic circuits, combinational logic circuits (decoders, encoders, multiplexers, demultiplexers and adders), and design of sequential logic devices using flip-flops, registers, and counters. **Prerequisite**: CCEE 221. **Prerequisite**: CCEE 221. Equivalent to COSC 351L.		

CCEE 331	Signals and Systems	3(3,0)
This course covers mathematical description and classification of continuous and discrete signals and systems. Topics include types of signals, Fourier series, Fourier transforms, Discrete-Time Fourier transforms (DTFT), Fast Fourier Transforms (FFT), Laplace transforms, z-transforms, linear time invariant systems, transfer functions, state-space representation. **Prerequisite:** MATH 211.		

CCEE 426	Design of Embedded Systems	3(3,0)
This course addresses the design of embedded real-time systems, models of computation, validation techniques, and automatic synthesis. Finite state machines, synchronous languages, data flow networks, petri nets, software optimization and performance estimation, operating systems and scheduling, system-level simulation, and interface-based design. **Prerequisite**: CCEE 221. Equivalent to COSC 356.		

CCEE 426L	Design of Embedded Systems Lab	1(0,2)
This lab complements topics covered in the CCEE 426 course. It involves design of embedded real-time systems, models of computation, validation techniques, and automatic synthesis. Experiments include Design using finite state machines, synchronous languages, data flow networks, petri nets, software optimization and performance estimation, scheduling, system-level simulation, and interface-based design. **Co-requisite**: CCEE 426. Equivalent to COSC 356L.		

CCEE 534	Signal Processing	3(3,0)
This course covers time series analysis, frequency analysis, time-frequency, and time-scale analysis. It also covers the design of digital filters and signal modeling. **Prerequisite**: CCEE 331.		

CIVE 211	Statics	3(3,0)
Static laws; force vectors and operations; force system and moment; free body diagram; equilibrium of particles and rigid bodies in 2D and 3D; plane trusses and frames; cables; internal forces: shear and moment diagrams; centroid and center of mass; moment of inertia; and friction. **Prerequisite**: None. Annually.		

ELEC 200	Introduction to Electrical and Computer Engineering	3(3,0)
In this course the student will be trained in core skills to equip them to excel in electrical, biomedical and computer and communications engineering. The student will be trained in application programming using an appropriate programming environment. Students will build on the basics of Programming learned in the introductory programming course to implement Digital Signal Processing applications and perform data analysis. Students will also be introduced to basic lab equipment such as Oscilloscopes, Function Generators, Multi-Meters. Students will be introduced to microcontrollers-based projects to explore more the Electrical and Computer Engineering majors (CCE, BIOM and ELEC major). Throughout the course, students will be working in multidisciplinary teams to study cases of Engineering for the community as well as implement a project to answer a need in the community.		

ELEC 210	Electric Circuits	3(3,0)
This course covers circuit elements and laws, mesh and node equations, network theorems, energy storage elements, RC, RL, and RLC circuits, transformers, sinusoidal (AC) steady state analysis, power calculation, and introduction to three phase circuits. **Prerequisite**: PHYS 191 or Equivalent.		

ELEC 320	Electronics	3(3,0)
A course on semiconductors, PN junctions, diode theory and circuits, bipolar junction transistors, transistor fundamentals, transistor biasing, amplifiers, JFETs, MOSFETs, and operational amplifiers. **Prerequisite**: ELEC 210		

ELEC 320L	Electronics Lab	1(0,2)
This is a Lab course with experiments in Electrical and Electronic Circuits. It covers passive electrical elements and sources; lab instruments; voltage divider circuits; Thevenin's theorem; RC circuits; diode circuits; Op-Amp circuits; BJT and MOSFET characteristics. **Co-requisite**: ELEC 320.		

ELEC 340	Engineering Electromagnetics	3(3,0)
Introduction to vector analysis, Electrostatic fields in vacuum and dielectrics Conductors, Capacitance, Electrostatic energy and forces, Poisson's equation. Magnetic fields Maxwell's equations, electric and magnetic static fields, boundary-value problems, Laplace's and Poisson's equation, and electromagnetic static fields. Time dependent Maxwell's equations and Plane wave propagation. **Prerequisite**: PHYS 211.		

ELEC 341	Measurements and Instrumentation	3(3,0)
This course covers the fundamentals of instrumentation and measurement of various physical quantities. Topics include sensor types, technologies, characteristics and calibration; design of a measurement system; statistical analysis of measured data; measurement noise and uncertainties; data acquisition, data storage and display devices; signal conditioning and interface electronics concepts including filtering, A/D		

and D/A conversion, amplification, modulation, compensation; applications; **Prerequisite**: ELEC 320, Annually.

ELEC 341L	**Measurements and Instrumentation Lab**	**1(0,2)**
The lab experience complements the topics covered in MECA 341. Students learn to use the NI ELVIS platform, LabVIEW programing and data acquisition systems characteristics to build a measurement system, perform data analysis and senor calibration, and design and build signal conditioning circuits for various types of measurements. The lab involves a team project to integrate all instrumentation and measurement tools and techniques are applied to build a measurement system and submit a report. **Co-requisite**: ELEC 341.		

ELEC 451	**Control Systems**	**3(3,0)**
Introduction to control systems; Modeling of systems in various energy domains; transfer function and block diagrams; time-domain analyses; Laplace domain analyses; frequency-domain analyses; stability; precision; rapidity; root locus; Bode, Nyquist and Nichols diagrams; design of PID controllers and dynamic compensators. **Prerequisite**: CCEE 331.		

ENGL 210	**English Composition and Rhetoric**	**3(3,0)**
This course reviews the fundamentals of good academic writing in English, teaches essay writing essentials and research skills in two rhetorical modes (persuasion and argumentation), and provides practice in writing essays in these modes, research paper, and oral presentation. **Prerequisite:** ENGL 101 or TOEFL 550+ (paper) or 80+ (computer).		

ENGL 217	**Professional English Communication**	**3(3,0)**
This is a required course designed to help students develop effective professional communication skills, both orally and in writing. In this course, students learn how to write emails, memos, letters, proposals, reports, and other forms of employment correspondence. In addition, this course helps students sharpen their presentation skills. Broadly, this course enables students to behave professionally and effectively in their prospective jobs. **Prerequisite**: ENGL 210.		

ENGR 300	**Engineering Economics and management**	**3(3,0)**
Concepts and techniques in basic Engineering economy principles and applications. Interest and financial mathematics; present worth, annual worth, benefit/cost ratio, internal rate of return, multiple alternatives, income tax, inflation, Risk analysis, Investment and investment choice, equivalence, loans, cost of capital, retirement and replacement, sector analysis and viewpoint, sensitivity analysis, accounting, and financial statements. **Prerequisite**: None.		

ENGR 510	**Engineering Project Management**	**3(3,0)**
The course covers key components of engineering project management including projects election and planning, project time management, cost estimation and pricing, contract and specifications, quality management, engineering ethics and professional		

conduct, realizing impact of engineering solutions in various contexts (global, economic, environmental, societal, etc...), sustainability in engineering designs, human resources consideration, communications, risk management, and procurement management. **Prerequisite:** ENGR 300.

MATH 210	**Discrete Mathematics**	**3(3,0)**
Logic, propositional equivalences, predicates and quantifiers, methods of proof, proof strategy, mathematical induction, recursive definitions, and structural induction, sets and set operations, functions, growth of functions, basics of counting, permutations and combinations, Binomial theorem, relations and their properties, representing relations, equivalence relations, introduction to graphs, graph terminology, introduction to trees.		

MATH 211	**Calculus III**	**4(4,0)**
Hyperbolic functions and their inverses, infinite sequences and series, polar coordinates, cylinders and quadric surfaces, functions of several variables, partial derivatives, Multiple integrals in rectangular, cylindrical, and spherical coordinates, substitutions.		

MATH 311	**Linear Algebra with Applications**	**3(3,0)**
Systems of linear equations, matrix algebra, linear transformations, determinants, vector spaces, eigenvalues and eigenvectors, symmetric matrices, orthogonality, diagonalization.		

MATH 314	**Ordinary Differential Equations**	**3(3,0)**
First order linear differential equations, linear differential equations of second and higher order, linear differential equations with variable coefficients, series solutions, Legendre's and Bessel's equations, systems of differential equations, Laplace transforms and their inverses. **Prerequisite:** MATH 211.		

MATH 351	**Probability and Statistics**	**3(3,0)**
Probability and conditional probability, Discrete and continuous random variables, marginal distributions, expectation, variance-mean-median-covariance and correlation, conditional expectation, binomial, multinomial and Poisson distributions, Normal distribution, Sampling distribution, Prediction and confidence intervals, Hypothesis testing. **Prerequisite**: MATH 211.		

MATH 421	**Numerical Analysis**	**3(3,0)**
Error Analysis, solutions of nonlinear equations using fixed point- Newton-Raphson-Muller's methods, solution of linear system using Gaussian elimination-iterative methods, interpolation and approximation using Taylor series-Lagrange approximation-Newton polynomials, numerical differentiation and integration, numerical optimization, solutions of ordinary and partial differential equations using Euler's and Heun's and Rung-Kutta methods. **Prerequisite**: MATH 311.		

PHYS 211	Physics: Electricity and Magnetism and Lab	3(3,1)
This course covers fundamental topics in Electricity and Magnetism: Electric forces and Electric Fields for discrete and continuous charge distribution, Gauss's Law, Electric Potential, Capacitance and Dielectrics, Kirchhoff's rules, Magnetic Fields and Forces, Biot-Savart Law, Ampere's Law, Magnetic Flux and Gauss's Law in Magnetism. It also includes a laboratory component that introduces students to the "real world" by offering a set of experiments in electricity and magnetism. **Prerequisite**: None.		

PHYS 312	Modern Physics	3(3,0)
This course introduces the principles of revolutionary developments of the 20th century. It covers interaction of light and matter (Photoelectric effect, Compton, Auger, etc.), the dual nature of light, various models of atomic description, quantum numbers, relativistic approach, Heisenberg Uncertainty Principle, Schrodinger Equation, and an introduction to the band theory of solids and to particle physics.		

Major Courses

Mandatory biomedical engineering courses are described below.

BIOM 301	Biomedical Sensors	3(3,0)
This course provides an introductory overview of the multidisciplinary field of sensors. The student is first introduced to the fundamental concepts of signals and noise in measurement, characteristics of the measurement system and determination of absolute quantity. Then the student learns about the different types of sensors to measure pressure, force, flow, motion and temperature.		

BIOM 301L	Biomedical Sensors Lab	1(0,2)
The lab teaches students how to measure and interpret different types of signals. Experiments include signal, noise, pressure (strain gauge) and temperature measurements; flow, motion and force measurements; and applications using research and simulation kits. **Co-requisite**: BIOM 301.		

BIOM 311	Biomedical Instrumentation	3(3,0)
The course describes the major medical electronic instruments used in diagnostic medicine. It explains the theoretical background, bloc diagrams and the circuitry of some prosthetic devices such as the different types of cardiac pacemaker, muscle and bladder prostheses, cochlear prosthesis, and the different types of cardiac defibrillator and cardioverters. **Prerequisite**: BIOM 301.		

BIOM 312	Biomedical Engineering Design	3(3,0)
This course deals with the genesis of various bioelectric phenomena and signals that are recorded routinely in modern clinical practice. Given adequate monitoring equipment, the engineer of today can record many forms of bioelectric phenomena with relative ease. This course describes theoretical, bloc diagram and the circuitry of the electrophysiological devices such as electrocardiogram, electroencephalogram, electroneurogram, electromyogram and the like. **Prerequisite**: BIOM 301.		

BIOM 312L	Biomedical Engineering Design Lab	1(0,2)
Accompanying Lab for BIOM 301 teaches students about measuring and interpreting biological and medical signals. Experiments cover the following topics: signal, noise, pressure (strain gauge) and temperature measurements; blood and gases flow, motion and force measurements; and applications using electrodes based on medical equipment and research and simulation kits. **Co-requisite**: BIOM 312.		

BIOM 400	Summative Learning (BS) Project	3(3,0)
Team-oriented, project-based experience that culminates in the creation of an artifact; milestones include project selection and proposal, creative solution, report, presentation, and demonstration of the created device. **Prerequisite**: Taken in the last semester of the BS Program; ENGL 217. Annually.		

BIOM 413	Bio-electronics Circuit Design	3(3,0)
This course focuses on design and measurement processes for medical systems and associated constraints. Students are required to apply the learned concepts in projects to design healthcare technology. **Prerequisites**: BIOM 301, **Co-requisite**: ELEC 320.		

BIOM 414	Advanced Biomedical Instrumentation	3(3,0)
The course describes the advanced medical electronic instruments used in therapeutic and diagnostic medicine. It includes the extracorporeal shock wave lithotripsy, infant incubator, medical laser application, ventilator and the different medical devices used in the operating room such as electrosurgical units and anesthesia units. **Prerequisite**: BIOM 311.		

BIOM 415L	Advanced Biomedical Lab	1(0,2)
Accompanying Lab for BIOM 414 teaches students about advanced medical electronic instruments used in therapeutic and diagnostic medicine. Experiments cover the following topics: extracorporeal shock wave lithotripsy, infant incubator, medical laser application, ventilator and the different medical devices used in the operating room such as electrosurgical units and anesthesia units. **Co-requisite**: BIOM 414.		

BIOM 416	Clinical Laboratory Instruments	3(3,0)
This course deals with the clinical laboratory that is responsible for analyzing patient specimens to provide information to aid in the diagnosis of disease and evaluate the effectiveness of therapy. The major topics covered in this course are spectrophotometry, flame photometers, spectrofluorometry, chemistry analyzers, hematology analyzers and chromatography columns. **Prerequisite**: BIOM 311.		

BIOM 417	Critical Care Equipment	3(3,0)
This course focuses on the interpretation of clinical data outputs, the description of modules integration and the manipulation of features relating to medical equipment (ME) found in surgical theater, intensive care units and emergency departments. Students are required to simulate ME's system function, to intervene in case of ME's failure, to upgrade available ME(s), to propose and implement, in a team-oriented project, a new design for a high risk medical technology. **Prerequisite:** BIOM 311.		

BIOM 421	Medical Imaging	3(3,0)
This course focuses on the physical and technical features as well as clinical application of imaging modalities used in health care facilities as diagnosis tools. Specific topics covered include Radiation; X-rays generators; Interaction; Attenuation; Photoelectric effect; Compton scattering; Filters; Collimators; Grids; Intensifying Screen; Fluoroscopic Image Intensifier; Resolution; Ultrasound Generation; US Scan; Transducers, Modes; Doppler. **Prerequisites**: PHYS 312		

BIOM 499	CO-OP Work Experience	1(0,0)
This CO-OP work experience is designed to provide students with an eight-week short-term work experience in the field of biomedical engineering. Students are encouraged to network in discipline-related industries. Report, poster, and power-point presentation are required. **Prerequisites**: ENGL 217; Senior Standing.		

BIOM 519	Advanced Therapeutic Devices	3(3,0)
This course describes the latest biomedical concepts and technologies used for therapeutic purposes. The major topics covered in this course are hemodialysis, hemofiltration and hemodiafiltration, ventilator and its modes, respiration modeling and spirometry parameters as well as diverse advanced therapeutic devices. **Prerequisite**: BIOM 414		

BIOM 522	Advanced Medical Imaging	3(3,0)
This course seeks to provide the student with a basic understanding of the concepts of Advanced Biomedical Imaging systems. It consists of dealing with tomographic modalities that result in 3D slices images. The course focuses on the nature of waves, physical principle, and instrumentation of each of the three concerned imaging technologies. It applies the interactions of radiation with human tissues and the fundamentals of slice reconstruction systems. Major applications are in Magnetic Resonance, Computed Tomography, Nuclear Medicine, PET, and SPECT scans. Specific topics covered include Radon; 2DFT, translations, rotations, generations, magnetic moment, spin, relaxations, gradient, superconductivity, sequence, contrast, k-space, resolution, artifacts, scintillation, positron, single photon emission. **Prerequisite**: BIOM 421		

BIOM 531	Clinical Engineering	3(3,0)
This course presents the mission, objectives, and responsibilities of biomedical engineering in health care delivery institutions. It focuses on possessing in-depth knowledge regarding effective and efficient usage of hospital technological resources. **Prerequisites**: BIOM 417/ BIOM421.		

BIOM 595A	BE Summative Learning Project 1	1(1,0)
The first phase of a team-oriented, project-based experience that culminates in the creation of an artifact; milestones include: project selection and proposal, creative solution, report, presentation, and demonstration of the created device. **Prerequisites**: ENGL 217.		

BIOM 595B	BE Summative Learning Project 2	3(3,0)
The second phase of a team-oriented, project-based experience that culminates in the creation of an artifact; milestones include: project selection and proposal, creative solution, report, presentation, and demonstration of the created device. **Prerequisite**: BIOM 595A.		

II. Elective Courses

Students may meet their engineering technical electives requirements from the following selection of elective courses.

BIOM 402	Radio Frequency Applications in Biomedical Engineering	3(3,0)
This course addresses radio frequency design and applications for biomedical engineering and medicine, based on electromagnetic radiation concept, circuit elements, coupling devices, modulation and demodulation parts, transmitters and receivers. Applications include telemetry, transcutaneous power transfer, hyperthermia, RF ablation, tagging and identification. **Prerequisite**: CCEE 331.		

BIOM 498	Special Topics in Biomedical Engineering	3(3,0)
This course is designed to enable students to study current special topics of interest which are carefully selected from BIOM-related topics. The contents of such a course are to be determined by the instructor and the department.		

BIOM 501	Emerging Healthcare Technologies	3(3,0)
This course aims to enable students to overview latest innovations in research areas of interest within the Bio-Engineering field. The course will mainly focus on introducing students to the evolving domain of biomedical technology through the interaction and skills combination of physicians, scientists, engineers, firms, and users. For instance, it will include explicit discussions of fast-growing health care practices that exhibit radical novelty. Students will learn to analyze how such evolutionary technologies can impact a wide range of sectors and associate to a number of stakeholders. The studies will emphasis on topics such as endoscope, brain mapping, heat therapy, and advanced vital signs measurements		

BIOM 502	AI Applications in Healthcare	3(3,0)
This course introduces artificial intelligence (AI) and its healthcare applications in machine learning and precision medicine. Students learn the core skills needed to assess clinical information data sets and apply these skills to enhance evidence-based healthcare outcomes. In this course, students apply AI knowledge and skills to promote effective disease management and patient engagement models.		

BIOM 503	Computational Neuroscience	3(3,0)
This course introduces basic computational methods for understanding what nervous systems do and for determining how they function. It will explore the computational principles governing various aspects of neural coding, dynamics, learning and		

memory. Specific topics cover representation of information by spiking neurons, processing of information in neural networks, graph theory, and algorithms for adaptation and learning. There will be usage of Matlab/Python demonstrations and exercises to gain a deeper understanding of different concepts and methods.

BIOM 504	Bio-Image Processing	3(3,0)
This course introduces the basic theories and methodologies of digital image processing. Topics include intensity transformations for image enhancement, two-dimensional discrete Fourier transform, spatial and frequency domain linear image filtering, nonlinear image filtering, binary image processing, edge detection, image segmentation, and digital video processing basics. This course makes extensive use of MATLAB as an analysis, design, and visualization tool. **Prerequisite**: CCEE 321.		

BIOM 505	Computer Simulations for Life Sciences	3(3,0)
This course introduces mathematical tools and algorithms implemented to simulate dynamic biological and medical processes. The course examines the modeling methodologies as well as simulation techniques of existing software such as Matlab/Simulink, Labview, and others. Specific topics covered include System's mode, Compartments, Physiological mechanisms, Monitoring medical parameters, Simulation tools, Parameters estimation, Identification and prediction.		

BIOM 506	Biomaterials	3(3,0)
The course studies cell-surface interactions carried through the adhesive proteins of physiological medium, analysis of signal transduction and cellular functions induced by surface controlled. An emphasis is given to biomaterial polymers, ceramics, and bone substitutes. Research applications include aid in the diagnosis of malignant tumor and nanobiotechnology for the coating of medical devices. **Prerequisite**: BIOM 311.		

BIOM 507	Bio-fluids	3(3,0)
This course is designed to enable students to overview main fluids of human body, their behaviors as well as the latest related clinical and surgical applications. The course will be mainly focused on introducing students to bodily fluids summary, basic fluid mechanics concepts, functional properties of blood and gas exchange and transport. Also, it includes deep discussions of recent health care practices based on control aspects of the vascular system and hemodynamics of large arteries.		

BIOM 508	Microcontroller and Embedded Systems for Biomedicine	3(3,0)
This course explains the architecture of microcontroller-based systems; registers, timers, interrupts, ports, memory; serial communication and design. It also covers parallel communication and design; analog to digital conversion and the use of PIC 16F84 and PIC 16F877 microcontrollers. MPLAB, PROTEUS and mikroC software are used. **Prerequisite**: CCEE 426.		

BIOM 512	**Biomechanics and Rehabilitation Engineering**	**3(3,0)**
This course will focus on the human musculoskeletal system. It emphasizes various engineering principles governing biological materials and will apply these to the study of bone, cartilage, ligaments, tendons and muscles. It covers: Bone, Joint, Ligament, Tendon, Cartilage, Viscosity, Elasticity, Plasticity, Stress, Strain, Muscle, Length, velocity, Moment Arm, Contractile Element, EMG, Lagrangian, and Rehabilitation Mechanics. **Prerequisites**: CIVE 211/BIOM 311.		

BIOM 513	Hemodynamics Measurement	**3(3,0)**
This course enables the students to study the basic principles of hemodynamics measurement. The students will learn the different techniques to measure the blood flow, pressure, compliance, and resistance in invasive and non-invasive methods. In addition, there will be coverage of the qualitative and quantitative measures of cardiopulmonary functions.		

BIOM 521	**Introduction to E-Health Care**	**3(3,0)**
This course emphasizes current uses and application of telecommunications approaches for medical diagnosis and patient care. It examines collaborative arrangements for real-time management of patients at a distance using wireless, mobile and robotic technologies. **Prerequisite**: BIOM 421.		

BIOM 532	**Biomedical Servicing**	**3(3,0)**
This course provides students with technical knowledge and skills necessary to become a broad-based electro-medical specialist. Students will learn to install, set up, troubleshoot, integrate, program, test, operate, and repair systems and components. The topics covered in this course include inspection, corrective and preventive maintenance, calibration, repair, supply management, best practices and accreditation of medical equipment.		

BIOM533	**Health-care Facility Management**	**3(3,0)**
This course presents procedures followed for medical and health services management. It covers the duties of administrator and his assistants, as well as work flow between staffs of different services and departments. This course emphasizes topics such as credentials, quality control, human resources, finances, recovery, insurance, sterilization, and infection control and health safety procedures.		

BIOM 597	**Advanced Topics in Biomedical Engineering**	**3(3,0)**
This course is designed to enable students to study a given advanced topic of interest, which is carefully selected from the biomedical engineering-related topics. The content outline of such a topic is to be determined by the instructor and to be approved by the department Chair. **Prerequisite**: Senior Standing		

MECHANICAL AND MECHATRONICS ENGINEERING DEPARTMENT (MME)

Chairperson:	Nadim Diab
Professor:	Ahmad Chaaban
Associate Professors:	Nadim Diab, Ahmad Kobeissi
Assistant Professors:	Iyad Faisal
Adjunct Faculty:	Omar Berjaoui, Rida Nuwayhid, Khaled Fawaz, Maya Maatouk
Instructor:	Mohamad Al Kaderi

Programs Offered

The Mechanical and Mechatronics Engineering (MME) Department offers two programs – Mechanical Engineering (MECH) and Mechatronics Engineering (MECA). Each program grants three degrees: Bachelor of Science, Bachelor of Engineering and Master of Science. The details of each program follows.

Vision

To be recognized for the ability, agility and tenacity of its graduates in confronting the challenges of a changing work place.

MECHANICAL ENGINEERING PROGRAM

Mission

The mission of the Mechanical Engineering program at RHU is to provide solid education necessary for the students to start a professional career and/or to continue graduate studies in mechanical engineering. The program seeks to instill in the students a feeling for, and understanding of, the moral and professional responsibilities, the ability to learn more, and the leadership required in their calling, mainly in Lebanon and the Middle East regions.

Objectives

In a few years after graduation, Mechanical Engineering program graduates will:

1. Apply their multidisciplinary knowledge in Mechanical engineering to meet employers' expectations.
2. Possess self-learning motivation and qualifications to pursue advanced studies.
3. Demonstrate professional skills and embrace leadership roles in their profession and/or communities.

Program Outcomes

Upon successful completion of the BS/BE program in Mechanical Engineering graduates will have:

1. Ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Ability to communicate effectively with a range of audiences
4. Ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Accreditation

The Bachelor of Engineering program in Mechanical Engineering has been accredited by the Engineering Accreditation Commission (EAC) of **ABET**, 415 North Charles Street, Baltimore, MD 21201; www.abet.org.

Career Opportunities

Mechanical engineers attain a broad spectrum of skills sought after by a wide range of professions. Industrial sectors, enterprises, and services in which a mechanical engineer can pursue a career include power generation and distribution, building and construction, medicine and pharmacology, aerospace, automotive, chemicals, computers and electronics, renewable energy, entertainment, water resources, sports, environmental institutions, and government.

Mechanical engineering also serves as an excellent foundation for careers in business management and business consulting.

Program Overviews

The Mechanical Engineering Program at Rafik Hariri University puts the best of students' interest, first and foremost. Every little experience the student attains represents a block in the building of a competent, confident, purposeful, problem solving, competitive, responsible, and conscientious individual. This is accomplished by means of a curriculum and facilities that conform to the highest of standards, faculty members committed to the academic and personal growth of the student, and an environment that inspires learning and drives creativity.

The Bachelor of Engineering (BE) program in Mechanical Engineering encompasses 147 credit hours spread over eight regular semesters and three summer semesters. The Bachelor of Science (BS) program comprises a total of 114 credit hours spread over six regular semesters and three summer semesters. In addition to completing the credits requirements, a BS or a BE degree is conferred upon a student if the earned Cumulative GPA, Major GPA and the Summative Learning Project grade are all 70 or above.

The required credit hours span three categories: University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours for the BS and BE programs are shown in the following table:

BS in Mechanical Engineering (114 Credits)						
Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	0	0	21	6	27	24
College Requirements	0	0	22	3	25	22

Program Requirements	48	0	14	0	62	54
Credits	48	0	57	9	114	100

BE in Mechanical Engineering (147 Credits)						
Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	0	0	21	9	30	20
College Requirements	0	0	25	3	28	19
Program Requirements	55	15	19	0	89	61
Credits	55	15	65	12	147	100

II. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Engineering section in this catalog.

III. College Requirements

The list of the College required courses and their descriptions are presented in the introductory pages of the College of Engineering section in this catalog.

IV. Program Requirements

The program requirements for a Bachelor of Engineering degree in Mechanical Engineering

Engineering encompasses 88 credits (61 credits for the BS degree) distributes as follows: 73 credits (61 credits for the BS degree) Mandatory courses and 15 credits elective courses.

A. Mandatory Requirements

The major and non-major Mechanical Engineering program mandatory courses are listed in the table below.

Course #	Title	Credits	Prerequisites
CIVE 211	Statics	3	
ELEC 320/320L	Electronics + Lab	4	ELEC 210
MECA 340	Dynamic Systems Modeling	3	MATH 314
MECA 341/341L	Measurements and Instrumentation + Lab	4	ELEC 320
MECH 400*	Summative Learning (BS) Project	3	ENGL 217
MECA 440	Control Systems Design	3	MECA 340
MECH 200	Introduction to Mechanical Engineering	3	

MECH 220	Dynamics	3	CIVE 211
MECH 223	Material Science	3	
MECH 224	Mechanical Engineering Graphics and CAD	3	
MECH 320	Mechanics of Materials	3	CIVE 211
MECH 321	Mechanisms and Dynamics of Machinery	3	MECH 200 and MECH 220
MECH 330	Thermodynamics I	3	MATH 211
MECH 334/334L	Thermodynamics II + Lab	4	MECH 330
MECH 335	Fluid Mechanics	3	MECH 330
MECH 421	Mechanical Design I	3	MECH 320
MECH 422	Manufacturing processes	3	MECH 320
MECH 423	Mechanical Design II	3	MECH 223, MECH 321, and MECH 421
MECH 431	Heat Transfer	3	MECH 333 or MECH 335 and MATH 317
MECH 438	Fluid Mechanics and Heat Lab	1	MECH 431
MECH 435	HVAC	3	MECH 431
MECH 499	Co-op Work Experience	1	ENGL 217; Senior Standing
MECH 520	Finite Element Method for Engineers	3	MECH 320 MATH 421
MECH 521	Vibrations and Acoustics	3	MECA 340
MECA 541	CAD/CAM/CAE	3	MECH 224, MECH 421
MECH 595A	BE Summative Learning Project - I	1	ENGL 217 Senior Standing
MECH 595B	BE Summative Learning Project - II	2	MECH 595A
MECH 4xx/5xx	Technical Electives	15	Course requirement

* Required of BS bound students. BE students take Technical Elective instead.

B. Technical Electives

As part of the program for the Bachelor of Engineering in Mechanical Engineering, the student is required to study 15 credit hours of technical elective courses. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. The student can also mix and match elective courses from the different areas to get a more general exposure to the different Mechanical Engineering disciplines. The student should select, in cooperation with the academic advisor, the list of electives that best meet his or her needs and aspirations. The listed technical elective courses and other courses from other engineering programs, in addition to the required program courses,

are designed to allow the student to develop in-depth knowledge and understanding in the following areas:

- Mechanical Design and Manufacturing
- Energy and Thermo-fluid Systems

It is highly recommended that the student takes elective courses from the list below after completing the mandatory requirements in the related area. Students may select technical electives from other programs subject to approval of the academic advisor and the corresponding course instructor.

Course #	Title	Credits	Prerequisites
Mechanical Design and Manufacturing			
MECH 445	Automotive Engineering	3	MECH 330 or 333 and MECH 321
MECH 470	Product Design and Development	3	MECH 421
MECH 498	Special Topics in Mechanical Engineering	3	
MECH 523	Mechanics of Composite Materials	3	MECH 320
MECH 524	Elasticity and Plasticity	3	MECH 320
MECH 525	Advanced Dynamics	3	MECH 220
MECH 527	Modern Material Science	3	MECH 223
MECH 570	Digital Manufacturing	3	MECH 422 and MECA 541
MECH 571	Optimization in Engineering Design	3	MATH 421
Energy and Thermo-fluid Systems			
MECH 436	Petroleum Refining Technology for Mechanical Engineers	3	CHEM 211, MECH320, MECH 330
MECH 437	Heat Exchanger Design, Performance, and Inspection	3	MECH 320, MECH 431
MECH 445	Automotive Engineering	3	MECH 330 or 333 and MECH 321
MECH 448	Plumbing Engineering	3	MECH 335 or MECH 333
MECH 451	Fluid Mechanics II	3	MECH 335
MECH 453	Buildings and Energy	3	MECH 330 or MECH 333
MECH 455	Gas Turbines	3	MECH 330 or MECH 333
MECH 461	Thermal Systems Design	3	MECH 431
MECH 468	Internal Combustion Engines	3	MECH 334
MECH 471	Refrigeration	3	MECH 334
MECH 498	Special Topics in Mechanical Engineering	3	
MECH 530	Computational Fluid Dynamics	3	MECH 431

MECH 541	Renewable Energy	3	MECH 330 or MECH 333

C. Summative Learning Project

Students must complete a 3- credit hours course for BS (3-credits for BE; taken 1 credit in the first regular semester and 2 credits in the following regular semester) in which they work preferably in groups on a problem of concern to industry or the community at large, or to innovate a promising idea. The SLP could be an extension of the projects students had worked on in the Engineering for the community course to bring it to a more useful outcome.

D. Co-op Experience

Students must complete 8 weeks of practical training while working in an area related to his/her field of interest. The Co-op experience is usually fulfilled during the summer semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on student's progress throughout the Co-op period by conducting field visits and ensure that student's performance is aligned with his/her aspirations and employer's needs. Students are required to submit a formal report, a poster and make a formal presentation about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to require stipulate additional conditions.

Study Plan

The following study plan summarizes the courses and credits distribution for the Bachelor of Science (BS) and Bachelor of Engineering (BE) in MECH Engineering. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Fall Semester (16 Credits)			
CCEE 214	Introduction to Programming	3	
CIVE 211	Statics	3	
ENGL 210	English Composition and Rhetoric	3	Placement
MATH 211	Calculus III	4	
PHYS 210	Fundamentals of Physics and Lab	3	
Year 1, Spring Semester (15 Credits)			
ELEC 210	Electric Circuits	3	PHYS 191 or Equivalent
MATH 311	Linear Algebra with Applications	3	
MECH 200	Introduction to Mechanical Engineering	3	
MECH 220	Dynamics	3	CIVE 211
MECH 223	Material Science	3	
Year 1, Summer Semester (9 Credits)			
CHEM 211	Environmental Chemistry and Lab	3	

MECH 224	Mechanical Engineering Graphics and CAD	3	
	Humanities/Fine Arts Elective	3	
Year 2, Fall Semester (16 Credits)			
ELEC 320	Electronics	3	ELEC 210
ELEC 320L	Electronic Lab	1	Co-req: ELEC 320
MATH 314	Ordinary Differential Equations	3	MATH 211
MECH 330	Thermodynamics I	3	MATH 211
MECH 320	Mechanics of Materials	3	CIVE 211
MECH 321	Mechanisms and Dynamics of Machinery	3	MECH 200 and MECH 220
Year 2, Spring Semester (16 Credits)			
ENGL 217	Professional English	3	ENGL 210
MATH 351	Probability and Statistics	3	MATH 211
MECA 340	Dynamic Systems Modeling	3	MATH 314
MECH 334	Thermodynamics II	3	MECH 330
MECH 334L	Thermodynamics II Lab	1	Co-req: MECH 334
MECH 335	Fluid Mechanics	3	MECH 330
Year 2, Summer Semester (9 Credits)			
ENGR 300	Engineering Economics and Management	3	
MATH 317	Partial Differential Equations	3	MATH 314
	Social Sciences/Cultural Elective I	3	
Year 3, Fall Semester (15 Credits)			
MATH 421	Numerical Analysis	3	MATH 311
MECA 440	Control Systems Design	3	MECA 340
MECH 421	Mechanical Design I	3	MECH 320
MECH 422	Manufacturing Processes	3	MECH 320
MECH 431	Heat Transfer	3	MECH 333 or MECH 335 and MATH 317
Year 3, Spring Semester (17 Credits)			
ARAB 212	Arabic Language & Communication	2	
CMNS 200	Etiquette	1	Co-req.: ENGL 210
MECA 341	Measurements and Instrumentation	3	ELEC 320
MECA 341L	Measurements and Instrumentation Lab	1	Co-req: MECA 341
MECH 423	Mechanical Design II	3	MECH 223, MECH 321, and MECH 421
MECH 438	Fluid Mechanics and Heat Lab	1	MECH 431
	Science Elective	3	

	Engineering Technical Elective I*	3	Per course requirements
Year 3, Summer Semester (1 Credit)			
MECH 499	Co-op Work Experience	1	ENGL 217 Senior standing
The above 114 Credits complete the requirements for a Bachelor of Science Degree in Mechanical Engineering.			
Year 4, Fall Semester (16 Credits)			
ENGR 510	Engineering Project Management	3	ENGR 300
MECA 541	CAD/CAM/CAE	3	MECH 224, MECH 421
MECH 435	HVAC	3	MECH 431
MECH 595A	BE Summative Learning Project I	1	ENGL 217 Senior Standing
	Engineering Technical Elective II	3	Per course requirements
	Engineering Technical Elective III	3	Per course requirements
Year 4, Spring Semester (17 Credits)			
MECH 520	Finite Element Method for Engineers	3	MECH 320; MATH 421
MECH 521	Vibrations and Acoustics	3	MECA 340
MECH 595B	BE Summative Leaning Project II	2	MECH 595A
	Engineering Technical Elective IV	3	Per course requirements
	Engineering Technical Elective V	3	Per course requirements
	Social Sciences/Cultural Elective II	3	
Total BE credits: 147			

* BS bound students are required to take MECH 400 – Summative Learning (BS) Project I instead.
Note: Engineering Technical Electives (levels 400 or above) are selected as such:
6 credits restricted Departmental Electives
9 credits from any Engineering discipline of levels 400 or above.

Courses Description

I. Mandatory Courses

Non-Major Courses

Description of the mandatory, non-major courses follows.

CCEE 214	**Introduction to Programming**	**2(2,0)**
Understanding of the basic principles of programming and computer systems; Applications of programming to the solution of engineering problems; Control structures, functions, arrays, pointers and structures. **Prerequisite**: None.		

CCEE 214L	Introduction to Programming Lab	1(0,2)
Laboratory experiments of programming for concepts covered in CCEE 212 course. **Co-req**: CCEE 214.		

CHEM 211	Environmental Chemistry and Lab	3(2,2)
This course provides an opportunity to develop an understanding of several basic environmental functions, the complicated nature of environmental systems, and the need for multidisciplinary solutions to environmental problems. Topics covered include the hydrosphere, water quantity and quality, soil and the soil ecosystem, biological resources, waste disposal, air pollution, ozone depletion, acid rain, global warming. The course also includes set of experiments that offer students practical experience in different environmental analysis settings including air and water quality. **Prerequisite**: None.		

CIVE 211	Statics	3(3,0)
Static laws; force vectors and operations; force system and moment; free body diagram; equilibrium of particles and rigid bodies in 2D and 3D; plane trusses and frames; cables; internal forces: shear and moment diagrams; centroid and center of mass; moment of inertia; and friction. **Prerequisite**: None. Annually.		

ELEC 210	Electric Circuits	3(3,0)
This course covers circuit elements and laws, mesh and node equations, network theorems, energy storage elements, RC, RL, and RLC circuits, transformers, sinusoidal (AC) steady state analysis, power calculation, and introduction to three phase circuit. **Prerequisite**: PHYS 191 or Equivalent.		

ELEC 320	Electronics	3(3,0)
This course covers semiconductors, PN junctions, diode theory and circuits, bipolar junction transistors, transistor fundamentals, transistor biasing, amplifiers, MOSFETs, and operational amplifiers. **Prerequisite:** ELEC 210.		

ELEC 320L	Electronics Lab	1(0,2)
This is a Lab course with experiments in Electrical and Electronic Circuits. It covers passive electrical elements and sources; lab instruments; voltage divider circuits; Thevenin's theorem; RC circuits; diode circuits; Op-Amp circuits; BJT and MOSFET characteristics. **Co-requisite:** ELEC 320.		

ENGL 210	English Composition and Rhetoric	3(3,0)
This course reviews the fundamentals of good academic writing in English, teaches essay writing essentials and research skills in two rhetorical modes (persuasion and argumentation), and provides practice in writing essays in these modes, research paper, and oral presentation. **Prerequisite:** ENGL 101 or TOEFL 550+ (paper) or 80+ (computer).		

ENGL 217	Professional English Communication	3(3,0)
This is a required course designed to help students develop effective professional communication skills, both orally and in writing. In this course, students learn how to write emails, memos, letters, proposals, reports, and other forms of employment correspondence. In addition, this course helps students sharpen their presentation skills. Broadly, this course enables students to behave professionally and effectively in their prospective jobs. **Prerequisite**: ENGL 210.		

ENGR 300	Engineering Economics and management	3(3,0)
Concepts and techniques in basic Engineering economy principles and applications. Interest and financial mathematics; present worth, annual worth, benefit/cost ratio, internal rate of return, multiple alternatives, income tax, inflation, Risk analysis, Investment and investment choice, equivalence, loans, cost of capital, retirement and replacement, sector analysis and viewpoint, sensitivity analysis, accounting and financial statements. **Prerequisite**: None. Annually.		

ENGR 510	Engineering Project Management	3(3,0)
The course covers key components of engineering project management including projects election and planning, project time management, cost estimation and pricing, contract and specifications, quality management, engineering ethics and professional conduct, realizing impact of engineering solutions in various contexts (global, economic, environmental, societal, etc...), sustainability in engineering designs, human resources consideration, communications, risk management, and procurement management. **Prerequisite:** ENGR 300.		

MATH 211	Calculus III	4(4,0)
Hyperbolic functions and their inverses, infinite sequences and series, polar coordinates, cylinders and quadric surfaces, functions of several variables, partial derivatives, Multiple integrals in rectangular, cylindrical, and spherical coordinates, substitutions.		

MATH 311	Linear Algebra with Applications	3(3,0)
Systems of linear equations, matrix algebra, linear transformations, determinants, vector spaces, eigenvalues and eigenvectors, symmetric matrices, orthogonality, diagonalization.		

MATH 314	Ordinary Differential Equations	3(3,0)
First order linear differential equations, linear differential equations of second and higher order, linear differential equations with variable coefficients, series solutions, Legendre's and Bessel's equations, systems of differential equations, Laplace transforms and their inverses. **Prerequisite:** MATH 211.		

MATH 317	Partial Differential Equations	3(3,0)
Introduction to the theory, solutions, and applications of partial differential equations. Methods of solving first order linear differential equations, method of characteristics: Lagrange theorem, boundary conditions of first order equations, non-linear first order		

pde's, Charpit's equations, the complete integral, Clairaut's equation, and other types, envelope and singular solutions, second order pde's, classification: hyperbolic, parabolic, and elliptic, the method of separation of variables, introduction to Fourier series and integrals, boundary value problems: heat equation, wave equation, and Laplace equation. **Prerequisite**: MATH 314.

MATH 351	**Probability and Statistics**	**3(3,0)**
Probability and conditional probability, Discrete and continuous random variables, marginal distributions, expectation, variance-mean-median-covariance and correlation, conditional expectation, binomial, multinomial and Poisson distributions, Normal distribution, Sampling distribution, Prediction and confidence intervals, Hypothesis testing. **Prerequisite**: MATH 211.		

MATH 421	**Numerical Analysis**	**3(3,0)**
Error Analysis, solutions of nonlinear equations using fixed point- Newton-Raphson-Muller's methods, solution of linear system using Gaussian elimination-iterative methods, interpolation and approximation using Taylor series-Lagrange approximation-Newton polynomials, numerical differentiation and integration, numerical optimization, solutions of ordinary and partial differential equations using Euler's and Heun's and Rung-Kutta methods. **Prerequisite**: MATH 311.		

MECA 340	**Dynamic Systems Modeling**	**3(3,0)**
Introduction to dynamic modeling of mechanical, electrical, electromechanical, thermal, fluid, and mixed discipline systems; Block diagrams and computer simulation (MATLAB); State-variable solution; Laplace Transform solution; Laplace transform properties; inverse Laplace transform; transfer function, frequency response, first and second order systems. **Prerequisite**: MATH 314. Annually.		

MECA 341	**Measurements and Instrumentation**	**3(3,0)**
This course covers the fundamentals of instrumentation and measurement of various physical quantities. Topics include: sensor types, technologies, characteristics and calibration; design of a measurement system; statistical analysis of measured data; measurement noise and uncertainties; data acquisition, data storage and display devices; signal conditioning and interface electronics concepts including filtering, A/D and D/A conversion, amplification, modulation, compensation; applications; **Prerequisite**: ELEC 320. Annually.		

MECA 341L	**Measurements and Instrumentation Lab**	**1(0,2)**
The lab experience complements the topics covered in MECA 341. Students learn to use the NI ELVIS platform, LabVIEW programing and data acquisition systems characteristics to build a measurement system, perform data analysis and senor calibration, and design and build signal conditioning circuits for various types of measurements. The lab involves a team project to integrate all instrumentation and measurement tools and techniques are applied to build a measurement system and submit a report. **Co-requisite**: MECA 341. Annually.		

MECA 440	Control Systems Design	3(3,0)
This course focuses on the analysis and design of systems control. measure control system performance; Transient and steady state response analyses; Topics include analytical solutions analysis in time and S domain, root locus, Bode, Nyquist, Lead Lag controller design, and PID compensator design are covered, Analysis and design control systems in state space. Control system analysis and design using MATLAB and SIMULINK; set up a control system and understand and optimize its performance; **Prerequisites**: MECA 340. Annually.		

MECA 541	CAD/CAM/CAE	3(3,0)
Fundamental principles of computer aided design (CAD), computer aided manufacturing (CAM), and computer aided engineering (CAE); prototyping and distributed systems; specific rapid prototyping technologies; design for assembly; small batch manufacturing; continuous manufacturing; biotechnology and manufacturing. **Prerequisite**: MECH 224 and MECH 421. Annually.		

PHYS 210	Fundamentals of Physics and Lab	3(3,1)
Welcome to the Introductory Physics course. This course consists of: Review of Classical Mechanics, Fluid Mechanics, General Properties of Waves, Electric Forces, Electric Fields for Discrete and Continuous Charge Distribution, Gauss's Law, Electric Potential, Kirchhoff's Rules, Magnetic Fields and Forces, Qualitative Discussion of Maxwell's Equations. **Prerequisite**: None.		

Major Courses

Mandatory mechanical engineering courses are described below.

MECH 200	Introduction to Mechanical Engineering	3(3,0)
This course aims to give students a comprehensive overview of the basics of Mechanical Engineering concepts and applications. Engineering topics to be covered shall include an introduction to learn by practice concepts, micro-controllers (Arduino), sensors and actuators, materials, mechanisms, codes and standards, and robotics (LEGO Mindstorms). In addition, students will be introduced to engineering ethics and will learn how to apply the ASME/ABET code of ethics on practical case studies. The course also integrates development of hands-on skills, teamwork, and communication; exercises and projects engage students in the building, implementation, and testing of their designs. **Prerequisite**: None. Annually.		

MECH 220	Dynamics	3(3,0)
Brief review of statics; proper use of different coordinate systems: Cartesian and normal/tangential axes; kinematics of a particle: rectilinear, curvilinear, and relative motion; kinetics of a particle: force and acceleration, work and energy, impulse, and momentum; planar kinematics of a rigid body: translating and rotating axes, absolute and relative motion; planar kinetics of a rigid body: force and acceleration, work and energy, impulse and momentum. **Prerequisite**: CIVE 211. Annually.		

MECH 223	Material Science	3(3,0)
The course introduces the fundamentals of materials science. The following topics will be discussed: Classification of materials; atomic structure and inter-atomic bonding; crystalline structures & amorphous materials; imperfections in solids. Overview of Alloying, Analysis of Phase diagrams & heat treatment of metals. Discussion of electrical, thermal, magnetic and optical properties. **Prerequisite**: None. Annually.		

MECH 224	Mechanical Engineering Graphics and CAD	3(3,0)
Drafting principles; piece part and assembly drawings; generation of 2D and 3D drawings as well as solid models using AutoCAD; customizing AutoCAD for any particular application; generating 2D drawings using CAD/CAM software; generating parametric, feature based solids using the AutoDesk Mechanical Desktop. **Prerequisite**: None. Annually.		

MECH 320	Mechanics of Materials	3(3,0)
Mechanical stress, strain, and stress/strain relations under pure tension, compression, pure bending, and pure torsion of circular bars; 1-D thermal strain & stress; combined stresses; principal stresses; plane stress transformation & Mohr's circle; basic 3-D elastic stress/strain relations; Euler-elastic buckling of columns. **Prerequisite**: CIVE 211. Annually.		

MECH 321	Mechanisms and Dynamics of Machinery	3(3,0)
Mechanization of motion; kinematic analysis of linkage mechanisms; graphical synthesis of planar mechanisms; synthesis of cam-follower mechanisms (graphical and analytical designs); gear terminology and types of gears used in machines; analysis and synthesis of gear trains; velocity, acceleration, and force analysis of mechanisms. **Prerequisite**: MECH 200 and MECH 220. Annually.		

MECH 330	Thermodynamics I	3(3,0)
The course introduces interconversion of heat and work. It covers concepts of a given system and surroundings; thermodynamic state and properties of pure substances; work and heat; energy analysis (First Law of thermodynamics) of closed systems and control volumes; application to thermal conversion systems; Second Law of thermodynamics and Entropy. Prerequisite: MATH 211. Annually.		

MECH 333	Thermal Fluid Sciences	3(3,0)
This course seeks to impart thermal-fluid fundamental concepts (including Thermodynamics, Fluid Mechanics, and Heat Transfer) to non-mechanical engineering students. This course covers the following topics: thermodynamic state and properties of pure substances; concepts of work and heat; energy analysis of closed systems (First Law of Thermodynamics) and simple flow devices; fluid statics; Bernoulli's equation; conservation of mass and momentum, viscous flow in pipes, introduction to conduction and convection and radiation heat transfer. Prerequisite: MATH 211. Annually.		

MECH 334	Thermodynamics II	3(3,0)
This course focuses on real-world engineering examples & applications to give students a feel for how thermodynamics is applied in engineering practice. These cover: Exergy analysis; vapor and gas power cycles; refrigeration and heat pump systems; psychrometric basics and air conditioning. **Prerequisite**: MECH 330. Annually.		

MECH 334L	Thermodynamics II Lab	1(0,2)
This laboratory takes an experimental approach to demonstrate the fundamentals of thermodynamics. The lab includes: a bomb and gas calorimeter, miniature steam power plant, internal combustion engine bench, and an air conditioning unit. One or two design-oriented experiments following the Design-Build-Test methodology. **Co-requisite**: MECH 334. Annually.		

MECH 335	Fluid Mechanics	3(3,0)
This course introduces the fundamentals of fluid mechanics. The topics covered are fluid statics; Bernoulli's equation; conservation of mass, momentum and energy; overview of fluid kinematics; overview of finite control volume analysis; Navier-Stokes equations; viscous flow in pipes. Prerequisite: MECH 330. Annually.		

MECH 400	Summative Learning (BS) Project	3(3,0)
Team-oriented, project-based experience that culminates in the creation of an artifact; milestones include project selection and proposal, creative solution, report, presentation, and demonstration of the created device. **Prerequisite**: Taken in the last semester of the BS Program; ENGL 217. Annually.		

MECH 421	Mechanical Design I	3(3,0)
Materials properties; tools of machine design; stress, strain, and deformation of machine parts; statistical methods; static and fatigue failure theories; design of machine parts for strength under steady loads; design of machine parts for rigidity, deflection of beams and rotation of shafts; design of machine parts for strength under cyclic/dynamic loads; codes and standards. **Prerequisite**: MECH 320. Annually.		

MECH 422	Manufacturing Processes	3(3,0)
General overview of manufacturing; properties of materials; dimensions and tolerances; machining; casting; sheet metal forming; injection molding; thermoforming; plastic processing; fundamentals of process performance (rate, quality, cost, flexibility); variation and quality; sustainability; overview of additive manufacturing. Project. **Prerequisite**: MECH 320. Annually.		

MECH 423	Mechanical Design II	3(3,0)
Static & fatigue design of shafts and axles; design of permanent and non-permanent joints (screws, fasteners, bolting, welding); rolling-contact bearings; lubrication and journal bearings; Gears-general, spur and helical gears; flexible mechanical elements; power transmission case study; material selection; codes and standards; computer		

modeling; team project. **Prerequisites**: MECH 223, MECH 321, and MECH 421. Annually.

MECH 431	Heat Transfer	3(3,0)
The course introduces the relation of heat transfer to thermodynamics; steady and transient heat conduction in one and two dimensions; analytical and numerical solutions; extended surfaces; internal and external flow; forced and natural heat convection; introduction to heat radiation. Prerequisite: MECH 333 or MECH 335 and MATH 317. Annually.		

MECH 438	Fluid Mechanics and Heat Lab	1(0,2)
The lab includes: A pressure and temperature measurement bench, hydraulic bench (pumps, piping, weirs…), wind tunnel (Boundary Layer measurement, flow over a NACA 2412 airfoil, flow over a sphere, flow over a cylinder, smoke generator); cross, parallel and mixed flow heat exchanger units, thermal conductivity measurement. **Prerequisite**: MECH 431. Annually.		

MECH 435	HVAC	3(3,0)
Air conditioning basics; occupant comfort and indoor air quality; heating and cooling load calculations; HVAC controls; air conditioning systems and air delivery systems; refrigeration basics, methods, and applications. **Prerequisite**: MECH 431. Annually.		

MECH 499	Co-op Work Experience	1(1,0)
This Co-op work experience is designed to provide students with a five-week short-term work experience in the field of mechanical engineering. Students are encouraged to network in discipline-related industries. Report, poster, and power-point presentation, are required **Prerequisites**: ENGL 217; Senior Standing.		

MECH 520	Finite Element Method for Engineers	3(3,0)
This course focuses on the basic concepts of finite element methods; formulating shape functions and basic structural elements equations; modeling and analysis of 1-D, 2-D and 3-D structural analysis and heat transfer problems; finite element modeling and analysis using MATLAB and ANSYS. **Prerequisites**: MECH 320 and MATH 421. Annually.		

MECH 521	Vibrations and Acoustics	3(3,0)
This course covers: Free Vibrations, Vibrations with Damping, Harmonically Excited Vibrations, Complex N Degree-of-Freedom Systems, Continuous Vibrations, Fundamentals of Sound Waves and Acoustics in addition to Basic Machinery Vibration. Prerequisite: MECA 340. Annually.		

MECH 595A	BE Summative Learning Project I	1(1,0)
Team-oriented project which includes conducting and formulating experimental laboratory work and/or design problems on a specific approved topic of specialty. The project includes literature review and scope of work as well as project proposal. **Prerequisite**: Senior Standing, ENGL 217. Annually.		

MECH 595B	BE Summative Learning Project II	2(2,0)
Team-oriented project which includes conducting and formulating experimental laboratory work and/or design problems on a specific approved topic of specialty. The project includes literature review, design work, data collection, experimentation, data analysis and technical writing. **Prerequisite**: MECH 595A. Annually.		

II. Elective Courses

Students may meet their technical electives requirements from the following selection of elective courses.

MECH 436	Petroleum Refining Technology for Mechanical Engineers	3(3,0)
Crude oil; petroleum products; refinery configuration; process major equipment; crude distillation; catalytic reforming; hydro-treating; gasoline; gas treating; product blending; risk-based inspection; environmental control; economics. **Prerequisite**s: CHEM 211, MECH 330 and MECH 320. On demand.		

MECH 437	Heat Exchangers Design, Performance, and Inspection	3(3,0)
Quick review of “mechanics of materials” and “heat transfer”; Codes & Standards; Heat exchanger types and applications; Thermal design; Mechanical design; Inspection and testing; Efficiency; TEMA standard use; Design project; Laboratory testing. **Prerequisites**: MECH 320 and MECH 431. On demand		

MECH 445	Automotive Engineering	3(3,0)
Studies of automotive components; engine parts (crankshaft, camshaft, inlet/exhaust valves, piston/cylinder mechanism); power boosting (turbo/super charge); transmission; steering mechanism design; engine combustion and emissions; major project on simulation of overall engine performance. **Prerequisites**: MECH 330 or 333 and MECH 321. On demand.		

MECH 448	Plumbing Engineering	3(3,0)
Soil, waste, and vent piping; drainage system; piping systems for domestic and industrial hot and cold water, fuel oil, de-ionized and de-mineralized water; laboratory compressed air and vacuum; laboratory outlets; laboratory drains; vacuum pumps; general piping installation. **Prerequisites**: MECH 335 or MECH 333. On demand.		

MECH 451	Fluid Mechanics II	3(3,0)
Review of incompressible flow; potential flow; similitude, dimensional analysis, and modeling; external and open channel flow; pumps and turbines. **Prerequisite**: MECH 335. On demand		

MECH 453	Buildings and Energy	3(3,0)
Selected topics in low- energy building design: building history and energy usage; buildings physics; architectural and material considerations; building energy systems and the use of renewable energy systems; hands-on project. **Prerequisite**: MECH 330 or MECH 333. On demand.		

MECH 455	Gas Turbines	3(3,0)
Thermodynamic of gas turbines; Gas turbine design; comparison of designs; shaft power and aircraft propulsion cycles, component efficiencies, basic components, general considerations of turbomachinery design, axial compressors, combustors, clean combustion systems, fuel control, design point performance calculations, off-design behavior and matching procedure, project. **Prerequisite**: MECH 330 or MECH 333. On demand.		

MECH 461	Thermal Systems Design	3(3,0)
Modeling of thermal systems; system solution; design applications of optimization methods: Lagrange multipliers, search methods, and dynamic, geometric, and linear programming**. Prerequisite**: MECH 431. On demand.		

MECH 468	Internal Combustion Engines	3(3,0)
Fuels and their properties; review of basic thermodynamics and gaseous mixtures; combustion thermodynamics; engine types; combustion chambers; valve mechanisms; dynamic balance of ICE; flame temperature; dissociation and detonation; turbo charging and super-charging; testing and measurements; engine characteristics and performance; laboratory demonstration. **Prerequisite**: MECH 334. On demand.		

MECH 470	Product Design and Development	3(3,0)
Idea generation; concept generation; concept selection; functional analysis; engineering design process for systems and components; economic consideration; reliability analysis; product safety; design project. **Co-requisite**: MECH 421. On demand.		

MECH 471	Refrigeration	3(3,0)
Methods of producing cold: thermodynamic basis, first and second law analyses – vapor compression systems; ideal vs. actual cycles; single stage, multistage and cascaded systems; environmental consideration and alternate refrigerants; vapor absorption systems. **Prerequisite**: MECH 334. On demand.		

MECH 498	Special Topics in Mechanical Engineering	3(3,0)
Guided study and research on topics related to the major. **Prerequisite**: Instructor's Consent. On demand.		

MECH 523	Mechanics of Composite Materials	3(3,0)
Analysis of a thin sheet of align-fiber reinforced, elastic matrix (lamina) to layered structures comprised of these sheets (laminates); mechanics of the thick-sectioned components (of many microstructural compositions) desirable in many engineering applications; processing of composite materials; mechanical and thermal properties and their degradation with time; practical use; fatigue versus static strength; finite element application. **Prerequisite**: MECH 320. On demand.		

MECH 524	Elasticity and Plasticity	3(3,0)
Analysis of Cartesian tensors using indicial notation; 3-D stress and strain concepts; point stress and strain in relation to tensor concepts; deviatoric and spherical stress state; Octahedral shear stress; equations of equilibrium and compatibility; constitutive laws for 3-D elastic and elastic-plastic stress state; kinematic & isotropic hardening models in plasticity; finite element applications. **Prerequisite**: MECH 320. On demand.		

MECH 525	Advanced Dynamics	3(3,0)
General introduction; rigid body kinematics: translation (3-D), rotation (3-D), compositions of rotations, Euler-angles presentation of rotation, Roll-pitch-yaw presentation of rotation, axis-angle presentation of rotation, homogenous transformations, rotation matrix derivative, angular velocity, linear velocity, acceleration; rigid body kinetics: review of Newtonian dynamics, generalized coordinates, holonomic and non-holonomic constraints, virtual displacements, virtual work, D'Alembert's principle, Lagrange equations, Hamilton's principle, canonical transformations; applications of Hamiltonian dynamics; multi-body dynamics. **Prerequisite**: MECH 220. On demand.		

MECH 527	Modern Material Science	3(3,0)
Advanced coverage on metals and alloys; applications and processing of ceramics; characteristics, applications, and processing of polymers; surface properties enhancement; materials simulation; economics, environmental, and societal issues in material sciences; biomaterials and nano-scale materials. Prerequisite: MECH 223. On demand		

MECH 530	Computational Fluid Dynamics	3(3,0)
This course introduces computational techniques to solve thermal-fluid problems. It integrates applications using ANSYS and CFD theory where it covers the following: Structured and unstructured grids; an overview of various discretization methods with emphasis on the finite volume method; Diffusion term discretization; Convection term discretization; Source term discretization; Transient term discretization, implicit and explicit schemes; Direct and Iterative solvers, tridiagonal matrix algorithm (TDMA), Gauss-Seidel; CFD analysis process (domain generation, domain meshing, domain		

setup or mathematical modeling, and post-processing); customizing Ansys fluent solver through user-defined functions; application of ANSYS code to practical engineering problems. Prerequisite: MECH 431.

MECH 541	**Renewable Energy**	**3(3,0)**
Energy situation; energy conversion; solar power; Photovoltaic and thermoelectric conversion, ocean, tidal and wave power; wind power; biomass energy; the case of nuclear power; project. **Prerequisite**: MECH 330 or MECH 333. On demand.		

MECH 570	**Digital Manufacturing**	**3(3,0)**
In this course the student will get an insight of diagnosing and correcting operational flaws; modeling and fabrication based on additive manufacturing technologies; automation technologies; production planning, process quality control; use of modern four-axis Computer Numerical Control (CNC) machines, 3D printers and up-to-date software programs including AutoCAD, Inventor, Solid Works, and VisualCam. **Prerequisite**: MECH 422 and MECA 541. On demand.		

MECH 571	**Optimization in Engineering Design**	**3(3,0)**
Problem definition, cost function and constraints; local vs. global methods; deterministic vs. stochastic methods; linear vs. non-linear programming; constrained vs. unconstrained; continuous vs. discrete; gradient-based methods; combinatorial optimization techniques; applications to various engineering problems (single/multi-objective); project. **Prerequisite**: MATH 421. On demand.		

MINOR IN APPLIED PETROLEUM ENGINEERING TECHNOLOGY

Rationale

The Applied Petroleum Engineering Technology (APET) minor aims to address the expected national need for engineering personnel knowledgeable in the Oil and Gas field. It also serves to prepare undergraduate students for possible graduate studies in petroleum engineering and related fields.

It is mostly geared towards mechanical engineering students, but it should also accommodate students from a variety of engineering backgrounds given that all prerequisite courses are completed.

The program is primarily concerned with the technical, environmental, and economic aspects of extraction of oil and gas as well as downstream processing and handling. The goal is to apply fundamental knowledge relevant to upstream and downstream operations which will enhance the graduate's capability to perform as a good practitioner in a short period of time.

Program participants are required to complete a minimum of 18 credits of related coursework. Although not a requirement, with proper and timely advising they may also have their Co-op work experience or their BS project in Oil and Gas thus enhancing their capability.

To effectively cover the added coursework during fall and spring semesters, one full-time faculty member with specialty related to Petroleum/Chemical Engineering is required.

Program Objectives

The primary objectives of the APET minor program are to:

- Give engineering students basic knowledge of the Oil and Gas industry;
- Endow students with the ability to deal with applied Oil and Gas downstream engineering;
- Prepare qualified Lebanese graduates to become productive contributors to the future Lebanese petroleum sector;
- Provide an impetus for undergraduate students to pursue graduate studies in the Oil and Gas domain.

Learning Outcomes

After completing the minor program, students should have the ability to:

- Apply relevant knowledge of mathematics, science and engineering to identify, formulate, and solve practical problems related to downstream petroleum engineering processes;
- Use modern engineering tools relevant to core petroleum engineering practices;
- Deal with the uncertainty and risk involved in petroleum transportation, refining, and storage problems.

Career Options

This minor allows the APET holders to start careers as field technologists in line with the exploration, transportation, refining, and storage sectors of the conventional oil and gas production industry. Typical employers include oil and gas Companies; oil service companies including QA/QC sector; government related agencies; and refineries.

Program Requirements

While most relevant to mechanical engineering students, this minor is offered to undergraduate RHU students in the BS program, from different disciplines (mechanical, mechatronics, civil, electrical, computer and communications and biomedical). It may also be offered to students with a BS/BE from other universities subject to a case-by-case evaluation of their transcripts and other specific RHU requirements. Proper advising is pertinent to the timely completion of the minor.

To successfully complete the APET minor, a student must:

1) Declare an APET minor by completing the Minor Declaration Form.
2) Obtain the approval of the dean of the college major and the dean of the College of Business Administration;.
3) Obtain a Minor Cumulative Grade Point Average of no less than 70 %.
4) Complete 18 credits of coursework as specified below.

APET Curriculum

The program strikes a proper balance between fundamentals and practice while it prepares students to become productive contributors in the oil and gas domain. Accordingly, this minor shall include:

- Oil and gas chemistry and properties
- Design and analysis of systems and procedures for producing, and handling fluids;
- Decision making under conditions of risk and uncertainty;
- Safety hazards and environmental impact consideration and protection;
- Pipeline design and installation;
- Gas and oil processing and storage (gas, crude oil, and refined oil products);
- Refinery units and equipment inspection using codes and standards of international organizations such as API and ASME;

- Quality assurance and quality control aspects;
- National and regional macro-economic impact.

The APET curriculum encompasses 18 credits, 15 mandatory credits and 3 elective credits, selected to satisfy the requirements of the proposed program objectives and learning outcomes. The courses that encompass the minor are given below.

I. Mandatory Courses

Description of the five mandatory courses (15 credits) follows.

APET 200	**Petroleum Engineering**	**3(3,0)**
Overview of the petroleum engineering and petroleum industry: Nature of oil and gas reservoirs, exploration and drilling techniques, formation evaluation, well completions and production, surface facilities, reservoir mechanics, off-shore and in-shore structures, environmental considerations; new technologies, prospects; petroleum industry activities in Lebanon and the Middle East; available industry and challenges; Oil & gas safety issues.		

APET 201	**Crude Oil & Natural Gas Transportation & Storage**	**3(3,0)**
This course will introduce the petroleum student to natural gas and crude oil transportation and storage equipment design and operation; following the flow of gas from the wellhead to the gas & oil pipelines, to the storage tanks; calculations are performed on pipeline sizing, inspection, and installation; storage tanks design, installation and inspection; use of commercial software's. **Prerequisite**: APET 200.		

APET 203	**Modern Refining Technology**	**3(3,0)**
This course presents an introduction to petroleum refining technology; an overview of crude oil supply and petroleum product demand; a description of refinery process technology. Some refining technologies are described such as crude oil distillation, heavy oil conversion options, hydrotreating, and catalytic reforming. Some gas processing is also discussed. **Prerequisite**: APET 200.		

CHEM 213	**Physical and Organic Chemistry**	**3(3,0)**
This course will allow students to learn chemical principles related to General, Physical and Organic fields of chemistry. Topics include study of different states of matter, homogeneous and heterogeneous mixtures, study of endothermic and exothermic processes, discussion on surface phenomena and industrial applications of adsorption and absorption processes; Structure and properties of organic compounds, synthesis and reactions of various compounds, mechanism of radical substitution, electrophilic addition and electrophilic aromatic substitution, Liquids and liquid-gas solutions, viscosity and surface tension of liquids, name and write formulas of selected organic compounds generally found in oil and gas industries; Catalyst types and use. **Prerequisite**: general or environmental chemistry.		

GEOL 210	Petroleum Geology	3(3,0)
This course introduces the concepts of geology that are important to petroleum exploration and exploitation. Topics include the make-up of the Earth, plate tectonics, rocks and minerals, formation of sediments and sedimentary rocks, stratigraphy, geologic structures, oil and gas sources, reservoir engineering properties, exploration techniques, well evaluation and reservoir development.		

II. Elective Course

Students may choose one three-credit course from the following list.

APET 202	Materials Selection – Corrosion Monitoring and Control	3(3,0)
Topics will provide the student with an understanding of the factors involved in materials utilization in the petroleum equipment design and construction such as pressure vessels & piping; materials properties, basic welding principles and the applicable codes, standards, and engineering specification used for materials specification in the hydrocarbon industries. Common nondestructive testing procedures used on equipment and types of defects such as corrosion and cracks identification, Equipment strategy: monitoring and control. **Prerequisite**: APET 200.		

APET 300	Applied Fluid Mechanics	3(3,0)
Review of incompressible flow, turbulence and dimensional analysis; pipe flows; boundary layers, lift, drag and flow separation; compressible flow; turbo and rotating machinery, oil and gas issues.		

III. Program Prerequisites

Students who wish to study the APET minor must complete the following courses.

Course Code	Title	Credits
CHEM 211	Environmental Chemistry and Lab	3
ENGL 217	Professional English Communication	3
MATH 211	Calculus III	4
MATH 311	Linear Algebra with Applications	3
MATH 314	Ordinary Differential Equations	3
MATH 351	Probability and Statistics	3
MECH 320	Mechanics of Materials	3
MECH 330	Thermodynamics I	3
MECH 335	Fluid Mechanics	3
PHYS 210	Fundamentals of Physics and Lab	3

MECHATRONICS ENGINEERING PROGRAM

Mission

The mission of the Mechatronics Engineering program at RHU is to provide solid education necessary for the students to start a professional career and/or to continue graduate studies in mechatronics engineering. The program seeks to instill in the students a feeling for, and understanding of, the moral and professional responsibilities, the ability to learn more, and the leadership required in their calling, mainly in Lebanon and the Middle East regions.

Objectives

In a few years after graduation, Mechatronics Engineering program graduates will:

1. Apply their multidisciplinary knowledge in Mechatronics engineering to meet employers' expectations.
2. Possess self-learning motivation and qualifications to pursue advanced studies.
3. Demonstrate professional skills and embrace leadership roles in their profession and/or communities.

Program Outcomes

Upon successful completion of the BS/BE program in Mechatronics Engineering, graduates will have:

1. Ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Ability to communicate effectively with a range of audiences
4. Ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Accreditation

The Bachelor of Engineering program in Mechatronics Engineering has been accredited by the Engineering Accreditation Commission (EAC) of **ABET**, 415 North Charles Street, Baltimore, MD 21201; www.abet.org.

Career Opportunities

Mechatronics engineers attain a broad spectrum of skills that are central to the practice of almost any professional field. Mechatronics engineers can find career opportunities in industries and enterprises such as food processing, building and construction, medical and pharmaceutical industries, aerospace, automotive, chemical, oil and gas, computer and electronics, renewable energy, and far more. Most importantly, you will be prepared to be able to imagine something that never was and drive forward to make it a reality! There is so much to be had to guarantee the future of mankind and mechatronics engineers can tap the possibilities through the spirit of innovation and entrepreneurism.

Program Overview

At RHU, every experience the student has represents a block in building a competent, confident, purposeful, problem-solving, competitive, responsible, and conscientious individual. Mechatronics engineering, being a holistic approach to designing and developing multifaceted smart systems, has strength of remarkable dimensions. Student transformation is accomplished through a curriculum that orbits the edges of knowledge, facilities equipped with the latest technology and conformed, to the highest of norms, faculty members who are passionate and committed to the academic success and personal growth of the student, and an environment that inspires learning and drives discovery.

The Bachelor of Engineering (BE) program in Mechatronics Engineering encompasses 147 credit hours spread over eight regular semesters and three Summer Semesters. The Bachelor of Science (BS) program comprises a total of 114 credit hours spread over six regular semesters and three Summer Semesters. In addition to completing the credits requirements, a BS or a BE degree is conferred upon a student if the earned cumulative GPA, major GPA and the Summative Learning Project grades are all 70 or above.

The required credit hours span three categories: University requirements (UR), College requirements (CR) and Program requirements (PR). The allocation of the credit hours for the BS and the BE programs is shown in the following tables where the apparent multi-disciplinary nature of Mechatronics is obvious. This demonstrates the value of a degree in Mechatronics as a starting point for several higher degree paths.

BS in Mechatronics Engineering (114 Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General	0	0	21	6	27	24

Education						
College Requirement	0	0	22	3	25	22
Program Requirement	24	0	38	0	62	54
Credits	24	0	81	9	114	100

BE in Mechatronics Engineering (147Credits)						
Courses Category	Major		Non-Major		Credits	Percent
	Mandatory	Electives	Mandatory	Electives		
General Education	0	0	21	9	30	20
College Requirement	0	0	25	3	28	19
Program Requirement	36	15	38	0	89	61
Credits	36	15	84	12	147	100

I. University Requirements (General Education)

The list of the University required courses and their descriptions are presented in the introductory pages of the College of Engineering section in this catalog.

II. College Requirements

The list of the College required courses and their descriptions are presented in the introductory pages of the College of Engineering section in this catalog.

III. Program Requirements

The program requirements for a Bachelor of Engineering degree in Mechatronics Engineering encompasses 88 credits (61 credits for the BS degree) distributed as follows: 73 credits (61 credits for the BS degree) Mandatory courses and 15 credits elective courses.

A. Mandatory Requirements

The Mechatronics Engineering mandatory core courses (major and non-major) are listed in the table below.

Course #	Title	Credits	Prerequisites
CCEE 221/221L	Logic Design +Lab	4	
CIVE 211	Statics	3	
ELEC 320/320L	Electronics + Lab	4	ELEC 210
ELEC 331	Electric Machines	3	ELEC 210
MECA 340	Dynamic Systems Modeling	3	MATH 314
MECA 341/341L	Measurements and Instrumentation + Lab	4	ELEC 320

MECA 400*	Summative Learning (BS) Project	3	ENGL 217
MECA 440	Control Systems Design	3	MECA 340
MECA 441	Sensors and Actuators	3	MECA 341
MECA 442	Microcontrollers for Mechatronics	3(2+2)	CCEE 221 and MECH 200
MECA 443	Mechatronic System Design	3	MECA 440, 441 and 442
MECA 443L	Mechatronic System Design Lab	1	Co-req.: MECA 443
MECA 444	Mechatronic Systems Programming	3	CCEE 214 and MECH 200
MECA 499	Co-op Work Experience	1	ENGL 217 Senior Standing
MECA 541	CAD/CAM/CAE	3	MECH 224 and MECH 421
MECA 542	Industrial and Manufacturing Control	3	ELEC 320
MECA 544	Robotics	3	MECH 321
MECA 595A	BE Summative Learning Project I	1	ENGL 217 Senior Standing
MECA 595B	BE Summative Learning Project II	2	MECA 595A
MECA 4xx/5xx	Technical Electives	15	Per course requirement
MECH 200	Introduction to Mechanical Engineering	3	
MECH 220	Dynamics	3	CIVE 211
MECH 224	Mechanical Engineering Graphics & CAD	3	
MECH 320	Mechanics of Materials	3	CIVE 211
MECH 321	Mechanisms and Dynamics of Machinery	3	MECH 200 and MECH 220
MECH 333	Thermal Fluid Sciences	3	MATH 211
MECH 421	Mechanical Design I	3	MECH 320
MECH 422	Manufacturing Processes	3	MECH 320

* Required of BS bound students. BE students take Technical Elective instead.

B. Technical Electives

As part of the program for the Bachelor of Engineering in Mechatronics Engineering, the student is required to study 15 credit hours of technical elective courses. These courses allow the student to focus on a specific area for in-depth knowledge and understanding. The student can also mix and match elective courses from the different areas to get a more general exposure to different yet inter-related Engineering disciplines. The student should select, in cooperation with the academic advisor, the list of electives that best meet his or her needs and aspirations. The listed technical elective courses and other courses from other engineering programs, in addition to the required program courses, are designed to allow the student to develop in-depth knowledge and understanding in the following areas:

- Mechanisms and Robotics
- Automation

It is highly recommended that the student takes elective courses after completing the mandatory requirements in the related area. Students may select technical electives from other programs subject to approval of the academic advisor and the corresponding course instructor.

Course #	Title	Credits	Prerequisites
Mechanisms and Robotics			
MECA 485	Autotronics	3	
MECA 498	Special Topics in Mechatronics Engineering	3	
MECA 535	Expert Systems and Applied Intelligence	3	
MECA 543	Fluid Power Systems	3	MECH 333 or MECH 335
MECA 581	Systems Engineering	3	
Automation			
MECA 484	Civionics	3	
MECA 485	Autotronics	3	
MECA 498	Special Topics in Mechatronics Engineering	3	
MECA 515	Modern Control Systems	3	MECA 440
MECA 545	Integrated Automation Lab	1	Co-req: MECA 542
MECA 586	Mechatronics Drives	3	ELEC 320

C. Summative Learning Project

Students must complete a 3- credit hours course for BS (4-credits for BE; taken 1 credit in the first regular semester and 3 credits in the following regular semester) in which they work preferably in groups on a problem of concern to industry or the community at large, or to innovate a promising idea. The SLP could be an extension of the projects students had worked on in the Engineering for the community course to bring it to a more useful outcome.

D. Co-op Experience

Students must complete 8 weeks of practical training while working in an area related to his/her field of interest. The Co-op experience is usually fulfilled during the summer semester of the third year into the program. The Co-op office matches the Co-op assignment with the student's field of study and employer's interest. A faculty member follows up on student's progress throughout the Co-op period by conducting field visits and ensure that student's performance is aligned with his/her aspirations and employer's needs. Students are required to submit a formal report, a poster and make a formal presentation about their Co-op experience. While ENGL 217 and Senior Standing are the essential prerequisites to pursue the co-op training, the program has the mandate to require stipulate additional conditions.

Study Plan

The following study plan summarizes the courses and credits distribution for the Bachelor of Science (BS) and Bachelor of Engineering (BE) in MECA Engineering. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits	Prerequisites
Year 1, Fall Semester (16 Credits)			
CCEE 214	Introduction to Programming	3	
CIVE 211	Statics	3	
ENGL 210	English Composition and Rhetoric	3	Placement
MATH 211	Calculus III	4	
PHYS 210	Fundamentals of Physics and Lab	3	
Year 1, Spring Semester (15 Credits)			
ELEC 210	Electric Circuits	3	PHYS 191 or Equivalent
MATH 311	Linear Algebra with Applications	3	
MECH 200	Introduction to Mechanical Engineering	3	
MECH 220	Dynamics	3	CIVE 211
	Science Elective	3	
Year 1, Summer Semester (9 Credits)			
CHEM 211	Environmental Chemistry and Lab	3	
MECH 224	Mechanical Engineering Graphics & CAD	3	
	Humanities/ Fine Arts Elective	3	
Year 2, Fall Semester (16 Credits)			
CCEE 221	Logic Design	3	
ELEC 320	Electronics	3	ELEC 210
ELEC 320L	Electronics Lab	1	Co-req: ELEC 320
MATH 314	Ordinary Differential Equations	3	MATH 211
MECH 320	Mechanics of Materials	3	CIVE 211
MECH 321	Mechanisms and Dynamics of Machinery	3	MECH 200 and MECH 220
Year 2, Spring Semester (17 Credits)			
CCEE 221L	Logic Design Lab	1	CCEE 221
ENGL 217	Professional English Communication	3	ENGL 210
MATH 351	Probability and Statistics	3	MATH 211
MECA 340	Dynamic Systems Modeling	3	MATH 314
MECA 341	Measurements and Instrumentation	3	ELEC 320
MECA 341L	Measurements and Instrumentation Lab	1	Co-req: MECA 341
MECH 333	Thermal Fluid Sciences	3	MATH 211
Year 2, Summer Semester (9 Credits)			
ENGR 300	Engineering Economics and Management	3	
MATH 317	Partial Differential Equations	3	MATH 314
	Social Sciences I	3	

Year 3, Fall Semester (15 Credits)			
MECA 440	Control Systems Design	3	MECA 340
MECA 442	Microcontrollers for Mechatronics	3 (2+2)	CCEE 221 and MECH 200
MECA 441	Sensors & Actuators	3	MECA 341
MECH 421	Mechanical Design I	3	MECH 320
MECH 422	Manufacturing Processes	3	MECH 320
Year 3, Spring Semester (16 Credits)			
ARAB 212	Arabic Language & Communication	2	
CMNS 200	Etiquette	1	Co-req.: ENGL 210
ELEC 331	Electric Machines	3	ELEC 210
MATH 421	Numerical Analysis	3	MATH 311
MECA 443	Mechatronic System Design	3	MECA 440, 441 and 442
MECA 443L	Mechatronic System Design Lab	1	Co-req.: MECA 443
	Engineering Technical Elective I*	3	Per course requirements
Year 3, Summer Semester (1 Credits)			
MECA 499	Co-op Work Experience	1	ENGL 217 Senior Standing
The above 114 Credits complete the requirements for a Bachelor of Science Degree in Mechatronics Engineering			
Year 4, Fall Semester (16 Credits)			
ENGR 510	Engineering Project Management	3	ENGR 300
MECA 444	Mechatronic Systems Programming	3	CCEE 214 and MECH 200
MECA 541	CAD/CAM/CAE	3	MECH 224 and MECH 421
MECA 595A	BE Summative Learning Project I	1	ENGL 217; Senior Standing
	Engineering Technical Elective II	3	Per course requirements
	Engineering Technical Elective III	3	Per course requirements
Year 4, Spring Semester (17 Credits)			
MECA 542	Industrial and Manufacturing Control	3 (2+2)	ELEC 320
MECA 544	Robotics	3	MECH 321
	Engineering Technical Elective IV	3	Per course requirements
	Engineering Technical Elective V	3	Per course requirements
MECA 595B	BE Summative Learning Project II	2	MECA 595A
	Social Sciences/ Humanities Elective III	3	
Total BE credits: 147			

* BS bound students are required to take MECA 400 – Summative Learning (BS) Project instead.

Note: Engineering Technical Electives (levels 400 or above) are selected as such:
6 credit restricted Departmental Electives
9 credits from any Engineering discipline of levels 400 or above.

Courses Description

I. Mandatory Courses

Non-Major Courses

Description of the mandatory, non-major courses follows.

CCEE 214	Programming & Lab	3(2,2)
Understanding of the basic principles of programming and computer systems; Applications of programming to the solution of engineering problems; Control structures, functions, arrays, pointers and structures. Laboratory experiments. **Prerequisite**: None.		

CCEE 221	Logic Design	3(3,0)
This course addresses Boolean algebra and logic simplification techniques, data representation, and the design of combinational logic networks for decoders, encoders, multiplexers, and demultiplexers. Design of sequential logic devices including flip-flops, registers, and counters, as well as analysis of devices used to build logic networks, including programmable logic devices. **Prerequisite**: None.		

CCEE 221L	Logic Design Lab	1(0,2)
This Lab covers design techniques and implementation of combinational and sequential logic circuits. Experiments include logic gates, design and implementation of logic circuits, combinational logic circuits (decoders, encoders, multiplexers, demultiplexers and adders), and design of sequential logic devices using flip-flops, registers, and counters. **Prerequisite**: CCEE 221. **Prerequisite**: CCEE 221. Equivalent to COSC 351L.		

CHEM 211	Environmental Chemistry and Lab	3(2,2)
This course provides an opportunity to develop an understanding of several basic environmental functions, the complicated nature of environmental systems, and the need for multidisciplinary solutions to environmental problems. Topics covered include the hydrosphere, water quantity and quality, soil and the soil ecosystem, biological resources, waste disposal, air pollution, ozone depletion, acid rain, global warming. The course also includes a set of experiments that offer students practical experience in different environmental analysis settings including air and water quality. **Prerequisite**: None.		

CIVE 211	Statics	3(3,0)
Static laws; force vectors and operations; force system and moment; free body diagram; equilibrium of particles and rigid bodies in 2D and 3D; plane trusses and		

frames; cables; internal forces: shear and moment diagrams; centroid and center of mass; moment of inertia; and friction. **Prerequisite**: None. Annually.

ELEC 320	**Electronics**	**3(3,0)**
This course covers semiconductors, PN junctions, diode theory and circuits, bipolar junction transistors, transistor fundamentals, transistor biasing, amplifiers, MOSFETs, and operational amplifiers. **Prerequisite:** ELEC 210.		

ELEC 320L	**Electronics Lab**	**1(0,2)**
This is a Lab course with experiments in Electrical and Electronic Circuits. It covers passive electrical elements and sources; lab instruments; voltage divider circuits; Thevenin's theorem; RC circuits; diode circuits; Op-Amp circuits; BJT and MOSFET characteristics. **Co-requisite:** ELEC 320.		

ELEC 210	**Electric Circuits**	**3(3,0)**
This course covers circuit elements and laws, mesh and node equations, network theorems, energy storage elements, RC, R, and RLC circuits, transformers, sinusoidal (AC) steady state analysis, power calculation, and introduction to three phase circuit. **Prerequisite**: PHYS 191 or Equivalent.		

ELEC 331	**Electric Machines**	**3(3,0)**
This course covers magnetic circuits, fundamentals of electromechanical energy conversion, construction, testing, steady-state analysis, and operational characteristics of DC machines, transformers, induction machines and synchronous machines. **Prerequisite**: ELEC 210.		

ENGL 210	**English Composition and Rhetoric**	**3(3,0)**
This course reviews the fundamentals of good academic writing in English, teaches essay writing essentials and research skills in two rhetorical modes (persuasion and argumentation), and provides practice in writing essays in these modes, research paper, and oral presentation. **Prerequisite:** ENGL 101 or TOEFL 550+ (paper) or 80+ (computer).		

ENGL 217	**Professional English Communication**	**3(3,0)**
This is a required course designed to help students develop effective professional communication skills, both orally and in writing. In this course, students learn how to write emails, memos, letters, proposals, reports, and other forms of employment correspondence. In addition, this course helps students sharpen their presentation skills. Broadly, this course enables students to behave professionally and effectively in their prospective jobs. **Prerequisite**: ENGL 210.		

ENGR 300	**Engineering Economics and management**	**3(3,0)**
Concepts and techniques in basic Engineering economy principles and applications. Interest and financial mathematics; present worth, annual worth, benefit/cost ratio, internal rate of return, multiple alternatives, income tax, inflation, Risk analysis,		

Investment and investment choice, equivalence, loans, cost of capital, retirement and replacement, sector analysis and viewpoint, sensitivity analysis, accounting and financial statements. **Prerequisite**: None. Annually.

ENGR 510	**Engineering Project Management**	**3(3,0)**
The course covers key components of engineering project management including projects election and planning, project time management, cost estimation and pricing, contract and specifications, quality management, engineering ethics and professional conduct, realizing impact of engineering solutions in various contexts (global, economic, environmental, societal, etc.), sustainability in engineering designs, human resources consideration, communications, risk management, and procurement management. **Prerequisite:** ENGR 300.		

MATH 211	**Calculus III**	**4(4,0)**
Hyperbolic functions and their inverses, infinite sequences and series, polar coordinates, cylinders and quadric surfaces, functions of several variables, partial derivatives, Multiple integrals in rectangular, cylindrical, and spherical coordinates, substitutions.		

MATH 311	**Linear Algebra with Applications**	**3(3,0)**
Systems of linear equations, matrix algebra, linear transformations, determinants, vector spaces, eigenvalues and eigenvectors, symmetric matrices, orthogonality, diagonalization.		

MATH 314	**Ordinary Differential Equations**	**3(3,0)**
First order linear differential equations, linear differential equations of second and higher order, linear differential equations with variable coefficients, series solutions, Legendre's and Bessel's equations, systems of differential equations, Laplace transforms and their inverses. **Prerequisite:** MATH 211.		

MATH 317	**Partial Differential Equations**	**3(3,0)**
Introduction to the theory, solutions, and applications of partial differential equations. Methods of solving first order linear differential equations, method of characteristics: Lagrange theorem, boundary conditions of first order equations, non-linear first order pde's, Charpit's equations, the complete integral, Clairaut's equation, and other types, envelope and singular solutions, second order pde's, classification: hyperbolic, parabolic, and elliptic, the method of separation of variables, introduction to Fourier series and integrals, boundary value problems: heat equation, wave equation, and Laplace equation. **Prerequisite**: MATH 314.		

MATH 351	**Probability and Statistics**	**3(3,0)**
Probability and conditional probability, Discrete and continuous random variables, marginal distributions, expectation, variance-mean-median-covariance and correlation, conditional expectation, binomial, multinomial and Poisson distributions, Normal distribution, Sampling distribution, Prediction and confidence intervals, Hypothesis testing. **Prerequisite**: MATH 211.		

MATH 421	Numerical Analysis	3(3,0)
Error Analysis, solutions of nonlinear equations using fixed point- Newton-Raphson-Muller's methods, solution of linear system using Gaussian elimination-iterative methods, interpolation and approximation using Taylor series-Lagrange approximation-Newton polynomials, numerical differentiation and integration, numerical optimization, solutions of ordinary and partial differential equations using Euler's and Heun's and Rung-Kutta methods. **Prerequisite**: MATH 311.		

MECH 200	Introduction to Mechanical Engineering	3(3,0)
This course aims to give students a comprehensive overview of the basics of Mechanical Engineering concepts and applications. Engineering topics to be covered shall include an introduction to learn by practice concepts, micro-controllers (Arduino), sensors and actuators, materials, mechanisms, codes and standards, and robotics (LEGO Mindstorms). In addition, students will be introduced to engineering ethics and will learn how to apply the ASME/ABET code of ethics on practical case studies. The course also integrates development of hands-on skills, teamwork, and communication; exercises and projects engage students in the building, implementation, and testing of their designs. **Prerequisite**: None. Annually.		

MECH 220	Dynamics	3(3,0)
Brief review of statics; proper use of different coordinate systems: Cartesian and normal/tangential axes; kinematics of a particle: rectilinear, curvilinear, and relative motion; kinetics of a particle: force and acceleration, work and energy, impulse and momentum; planar kinematics of a rigid body: translating and rotating axes, absolute and relative motion; planar kinetics of a rigid body: force and acceleration, work and energy, impulse and momentum. **Prerequisite**: CIVE 211. Annually.		

MECH 224	Mechanical Engineering Graphics and CAD	3(3,0)
Drafting principles; piece part and assembly drawings; generation of 2D and 3D drawings as well as solid models using AutoCAD; customizing AutoCAD for any particular application; generating 2D drawings using CAD/CAM software; generating parametric, feature based solids using the AutoDesk Mechanical Desktop. **Prerequisite**: None. Annually.		

MECH 320	Mechanics of Materials	3(3,0)
Mechanical stress, strain, and stress/strain relations under pure tension, compression, pure bending, and pure torsion of circular bars; 1-D thermal strain & stress; combined stresses; principal stresses; plane stress transformation & Mohr's circle; basic 3-D elastic stress/strain relations; Euler-elastic buckling of columns. **Prerequisite**: CIVE 211. Annually.		

MECH 321	Mechanisms and Dynamics of Machinery	3(3,0)
Mechanization of motion; kinematic analysis of linkage mechanisms; graphical synthesis of planar mechanisms; synthesis of cam-follower mechanisms (graphical and analytical designs); gear terminology and types of gears used in machines;		

analysis and synthesis of gear trains; velocity, acceleration, and force analysis of mechanisms. **Prerequisite**: MECH 200 and MECH 220. Annually.

MECH 333	**Thermal Fluid Sciences**	**3(3,0)**
This course seeks to impart thermal-fluid fundamental concepts (including Thermodynamics, Fluid Mechanics, and Heat Transfer) to non-mechanical engineering students. These covers: thermodynamic state and properties of pure substances; concepts of work and heat, energy analysis of closed systems (First Law) and simple flow devices, Fluid statics; Bernoulli's equation; Conservation of mass, momentum & energy, viscous flow in pipes, introduction to conduction, convection and radiation heat transfer. **Prerequisite**: MATH 211. Annually.		

MECH 421	**Mechanical Design I**	**3(3,0)**
Materials properties; tools of machine design; stress, strain and deformation of machine parts; statistical methods; static and fatigue failure theories; design of machine parts for strength under steady loads; design of machine parts for rigidity, deflection of beams and rotation of shafts; design of machine parts for strength under cyclic/dynamic loads; codes and standards. **Prerequisite**: MECH 320. Annually.		

MECH 422	**Manufacturing Processes**	**3(3,0)**
General overview of manufacturing; properties of materials; dimensions and tolerances; machining; casting; sheet metal forming; injection molding; thermoforming; plastic processing; fundamentals of process performance (rate, quality, cost, flexibility); variation and quality; sustainability; overview of additive manufacturing. Project. **Prerequisite**: MECH 320. Annually.		

PHYS 210	**Fundamentals of Physics and Lab**	**3(3,1)**
Welcome to the Introductory Physics course. This course consists of: Review of Classical Mechanics, Fluid Mechanics, General Properties of Waves, Electric Forces, Electric Fields for Discrete and Continuous Charge Distribution, Gauss's Law, Electric Potential, Kirchhoff's Rules, Magnetic Fields and Forces, Qualitative Discussion of Maxwell's Equations. **Prerequisite**: None.		

Major Courses

Mandatory mechatronics courses are described below.

MECA 340	**Dynamic Systems Modeling**	**3(3,0)**
Introduction to dynamic modeling of mechanical, electrical, electromechanical, thermal, fluid, and mixed discipline systems; Block diagrams and computer simulation (MATLAB); State-variable solution; Laplace Transform solution; Laplace transform properties; inverse Laplace transform; transfer function, frequency response, first and second order systems. **Prerequisite**: MATH 314. Annually.		

MECA 341	**Measurements and Instrumentation**	**3(3,0)**
This course covers the fundamentals of instrumentation and measurement of various physical quantities. Topics include sensor types, technologies, characteristics, and		

calibration; design of a measurement system; statistical analysis of measured data; measurement noise and uncertainties; data acquisition, data storage and display devices; signal conditioning and interface electronics concepts including filtering, A/D and D/A conversion, amplification, modulation, compensation; applications; **Prerequisite**: ELEC 320. Annually.

MECA 341L	**Measurements and Instrumentation Lab**	**1(0,2)**
The lab experience complements the topics covered in MECA 341. Students learn to use the NI ELVIS platform, LabVIEW programing and data acquisition systems characteristics to build a measurement system, perform data analysis and senor calibration, and design and build signal conditioning circuits for various types of measurements. The lab involves a team project to integrate all instrumentation and measurement tools and techniques are applied to build a measurement system and submit a report. **Co-requisite**: MECA 341. Annually.		

MECA 400	**Summative Learning (BS) Project**	**3(3,0)**
Team-oriented, project-based experience that culminates in the creation of an artifact; milestones include project selection and proposal, creative solution, report, presentation, and demonstration of the created device. **Prerequisite**: for the last semester of the BS Program, ENGL 217. Annually.		

MECA 440	**Control Systems Design**	**3(3,0)**
This course focuses on the analysis and design of systems control. measure control system performance; Transient and steady state response analyses; Topics include analytical solutions analysis in time and S domain, root locus, Bode, Nyquist, Lead Lag controller design, and PID compensator design are covered, Analysis and design control systems in state space. Control system analysis and design using MATLAB and SIMULINK; set up a control system and understand and optimize its performance; **Prerequisites**: MECA 340. Annually.		

MECA 441	**Sensors and Actuators**	**3(3,0)**
Sensor and actuator technologies; classification and terminology of sensors and actuators; sensors characteristics; physical principles of sensing; measurement applications (position and speed, stress and strain, temperature, vibration and acceleration, pressure and flow…); Electromagnetic principles; solenoids and relays; electric motors (DC motors , Stepper motors…); Hydraulics actuators; Pneumatic actuators; interface methodologies and circuits; integration aspects; manufacturing techniques and material properties; team projects. **Prerequisite**: MECA 341. Annually.		

MECA 442	**Microcontrollers for Mechatronics**	**3(2,2)**
The aim of this course is to provide a deep understanding for the integration of microcontrollers in mechatronic systems starting from the technologies used to develop microcontrollers/microprocessors, to their internal features and peripherals (timers, interrupts, analog-to-digital converters…). In this course, students develop various microcontroller programs for mechatronic applications, including the usage of I/O and communication peripherals. **Prerequisite**: CCEE 221 and MECH 200.		

MECA 443	Mechatronic System Design	3(3,0)
This course is an integration of all mechatronics systems design modules. It consists of an overview of mechatronics; mechatronics systems design strategies; advanced modeling; usage of control strategies; design of electric actuators; design of sensors; power electronics; hardware and software integration; Team projects on design and implementation of integration between mechanical, electrical and control systems. **Prerequisite**: MECA 440, 441 and 442.		

MECA 443L	Mechatronic System Design Lab	1(0,2)
Overview on mechatronic systems; integration of mechanical components, sensors and actuators into mechatronics applications; use of switchgear components; integration of microcontrollers and FPGAs; LabVIEW programming; Design of power supplies. **Co-requisite**: MECA 443. Annually.		

MECA 444	Mechatronic Systems Programming	3(3,0)
Mechatronic systems programming is divided in two parts; first part of this course will equip the student with python programming for affordable single-board computers (ex. Raspberry Pi). In the second part of the course, students will learn the fundamentals of Robot Operating System (ROS) on which students can build their own robot environment, autonomous navigation (ex. SLAM) and manipulation. Applications of ROS techniques on robots (ex. TurtleBots, Dobot) and computer vision (object detection) will be introduced. **Prerequisite**: CCEE 214 and MECH 200. Annually.		

MECA 499	Co-op Work Experience	1(1,0)
This Co-op work experience is designed to provide students with a five-week short-term work experience in the field of mechanical engineering. Students are encouraged to network in the discipline-related industries. Report, poster, and power-point presentation, are required **Prerequisites**: ENGL 217 ; Senior Standing.		

MECA 541	CAD/CAM/CAE	3(3,0)
Fundamental principles of computer aided design (CAD), computer aided manufacturing (CAM), and computer aided engineering (CAE); prototyping and distributed systems; specific rapid prototyping technologies; design for assembly; small batch manufacturing; continuous manufacturing; biotechnology and manufacturing. **Prerequisite**: MECH 224 and MECH 421. Annually.		

MECA 542	Industrial and Manufacturing Control	3(2,2)
This course will give an overview of programmable logic controllers (PLCs) and explores different PLC hardware components; number systems and codes; fundamentals of Logic; generation, loading and testing of PLC programs required to operate electrical motors and mechanical actuators used in industrial processes; developing fundamental PLC Wiring Diagrams and Ladder Logic Programs with an emphasis on programming timers and counters; integrated automation solutions through various programming architecture such as function-block and ladder diagrams; configuration of process visualization of a panel. Prerequisite: ELEC 320. On demand.		

MECA 544	Robotics	3(3,0)
Introductory historical development of robotics; static grasp analysis; rigid objects Kinematics; degrees of freedom; robot arm kinematics; inverse kinematics; dynamics; kinematic singularities; introduction of trajectory planning and control of manipulators, screw motions;. **Prerequisite**: MECH 321. Annually.		

MECA 595A	BE Summative Learning Project I	1(1,0)
Team-oriented project which includes conducting and formulating experimental laboratory work and/or design problems on a specific approved topic of specialty. The project includes literature review and scope of work as well as project proposal. **Prerequisites**: Senior Standing, ENGL 217. Annually.		

MECA 595B	BE Summative Learning Project II	2(2,0)
Team-oriented project which includes conducting and formulating experimental laboratory work and/or design problems on a specific approved topic of specialty. The project includes literature review, design work, data collection, experimentation, data analysis and technical writing. **Prerequisite**: MECA 595A. Annually.		

II. Elective Courses

Students may meet their technical electives requirements from the following selection of elective courses.

MECA 484	Civionics	3(3,0)
Applications of mechatronic techniques to civil construction. This course will provide engineers with the background necessary to aid in optimizing design techniques and understanding infrastructure performance, behavior, and state of condition. The successful integration of intelligent sensing of innovative structures will allow civil structural engineers to expand the design envelope and introduce new design concepts, materials, and innovation in civil engineering. **Prerequisite**: Instructor's consent. On demand.		

MECA 485	Autotronics	3(3,0)
This course explores topics such as sensors and actuators in automotive, communication systems, can protocol, electronics circuits automotive standard, electronic suspension and steering, engine management and on-board diagnostics. **Prerequisite**: Instructor's consent. On demand.		

MECA 498	Special Topics in Mechatronics Engineering	3(3,0)
Guided study and research on topics related to the major. **Prerequisite**: Instructor's consent. On demand.		

MECA 515	Modern Control Systems	3(3,0)
In this course the student learns how to use data and correlate them to physical theory to build state space and control models; design, build and test controllability, feedback,		

observability, and stability in addition to black box modeling in both time and frequency domain. **Prerequisite**: MECA 440. On demand.

MECA 535	Expert Systems and Applied Intelligence	3(3,0)
The course covers fundamental principles of intelligent machinery, intelligent solutions for computationally complex engineering mechanisms. Perception methods of environment, strategies used in processing the perceptual inputs, learning from experience, reasoning techniques and search methods; Tools in intelligent systems; neural networks, evolutionary computing techniques (genetic methods), fuzzy logic, intuitionist fuzzy logic. Intelligent programming (prolog) and logic. **Prerequisite**: Instructor's consent.		

MECA 543	Fluid Power Systems	3(3,0)
Introduction to hydraulic and pneumatic systems: study of basic hydraulic/pneumatic circuit components: pipes, valves, pumps, motors, filters, accumulators, sensors, and silencers; analysis/design of various hydraulic/pneumatic circuits such as high-low, regenerative, and synchronization circuits; use of Matlab/Simulink for simulation of fluid power system circuits. **Prerequisites**: MECH 333 or MECH 335. On demand.		

MECA 545	Integrated Automation Lab	1(0,2)
This lab explores PID control algorithms; digital controllers and their components; tuning methods and process control; diagnosis and error search; analog value processing; communication between two and more PLCs. Co-requisite: MECA 542. On demand.		

MECA 581	Systems Engineering	3(3,0)
A course with an interdisciplinary approach intended to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem including operations, performance, test, manufacturing, cost, and schedule. This course emphasizes the links of systems engineering to fundamentals of decision theory, statistics, and optimization. Introduction to the most current, commercially successful techniques for systems engineering. **Prerequisite**: Instructor's consent. On demand.		

MECA 586	Mechatronics Drives	3(3,0)
Switched-mode converter, steady-state voltages and currents of step-down, step-up, inverting, and other power converters, power semiconductor devices in a switching converter, discontinuous conduction mode, solve converters operating in DCM, implement transformer isolation in a dc-dc converter, design and analyze the feedback systems of switching regulators, Design Project. **Prerequisite**: ELEC 320. On demand. **Prerequisite**: ELEC 320		

MECA 597	Advanced Topics in Mechatronics Engineering	3(3,0)
This course is designed to enable students to study a given advanced topic of interest, which is carefully selected from the mechatronics engineering-related topics. The content outline of such a topic is to be determined by the instructor and to be approved by the department Chair. **Prerequisite**: Instructor's consent. On demand.		

MINOR IN MANUFACTURING AND AUTOMATION ENGINEERING

Rationale

The Manufacturing and Automation Engineering (MAE) minor targets to widen the engineering students' knowledge of up-to-date automation in engineering techniques and manufacturing methods. It also serves to prepare undergraduate students for possible graduate studies in Manufacturing and Automation Engineering and other related fields.

It mostly targets mechanical and mechatronics engineering students, but it should also accommodate students from a variety of engineering backgrounds given that all prerequisite courses are completed.

The program mainly focuses on decision-making, material science, manufacturing processes, quality control, system integration, automation, and many other related topics. Therefore, by the end of this minor, a student is expected to be familiar with the economic study, design, material selection, manufacturing, assembly, control, and automation of the entire engineering production process.

Program participants are required to complete a minimum of 18 credits of related coursework. Although not a requirement, with proper and timely advising, they may also have their Co-op work experience or their BE project in Manufacturing and Automation Engineering thus enhancing their capability.

Program Objectives

The primary educational objectives of the MAE minor program are to:

- Give engineering students basic knowledge of the Manufacturing and Automation Engineering principles
- Equip students with the knowledge top pursue graduate studies in Industrial Engineering, Manufacturing Engineering, Automation Engineering, Materials Science, Engineering Management and other related disciplines

Learning Outcomes

After completing the minor program, students should have the ability to:

- Apply relevant knowledge of mathematics, science and engineering to identify, formulate, and solve practical problems related to Automation Engineering and modern Manufacturing processes
- Use modern CAD/CAM/CAE engineering tools
- Automate and control complex industrial equipment and processes

- Take apt decisions based on their comprehension of Professional and Ethical Behavior

Career Options

This minor allows the MAE holders to start careers in supply chain management, product design and development, quality control assurance, production lines, cost engineering departments, design, automation and operation of integrated systems and many others.

Program Requirements

While most relevant to mechanical and mechatronics engineering students, this minor is offered to undergraduate RHU students in the BS/BE program from different disciplines (mechanical, mechatronics, civil, electrical, computer and communications and biomedical). It may also be offered to students with a BS/BE from other universities subject to a case-by-case evaluation of their transcripts and other specific RHU requirements. Proper advising is pertinent to the timely completion of the minor.

To successfully complete the MAE minor, a student must

1) Declare an MAE minor by completing the Minor Declaration Form;
2) Obtain the approval of the dean of the college major;
3) Obtain a Minor Cumulative Grade Point Average of no less than 70 %.
4) Complete 18 credits of coursework as specified below

MAE Curriculum

The program offers a rich blend of fundamental sciences and practical hands-on experience where students are equipped with the essential knowledge to delve into the Manufacturing and Automation Engineering world. Accordingly, this minor shall include:

- Material science and metallurgy
- Advanced/modern manufacturing processes
- Product design, optimization, and development
- Manufacturing process quality control
- Economic, environmental, and societal aspects of the industry
- Industrial equipment automation and production process control

The MAE curriculum encompasses 18 mandatory credits selected to satisfy the requirements of the proposed program objectives and learning outcomes.

Mandatory Courses

The student must complete a minimum of 3 credit hours of coursework exclusive to the MAE minor that will not count toward requirements for his/her major or any other

minor. Description of the courses from which a student should select 18 credits is given below:

MECA 515	Modern Control Systems	3(3,0)
In this course the student learns how to use data and correlate them to physical theory to build state space and control models; design, build and test controllability, feedback, observability, and stability in addition to black box modeling in both time and frequency domain. **Prerequisite**: MECA 440. On demand.		

MECA 541	CAD/CAM/CAE	3(3,0)
Fundamental principles of computer aided design (CAD), computer aided manufacturing (CAM), and computer aided engineering (CAE); prototyping and distributed systems; specific rapid prototyping technologies; design for assembly; small batch manufacturing; continuous manufacturing; biotechnology and manufacturing. **Prerequisite:** MECH 224 and MECH 421. Annually.		

MECA 542	Industrial and Manufacturing Control	3(2,2)
This course will give an overview of programmable logic controllers (PLCs) and explores different PLC hardware components; number systems and codes; fundamentals of Logic; generation, loading and testing of PLC programs required to operate electrical motors and mechanical actuators used in industrial processes; developing fundamental PLC Wiring Diagrams and Ladder Logic Programs with an emphasis on programming timers and counters; integrated automation solutions through various programming architecture such as function-block and ladder diagrams; configuration of process visualization of a panel. **Prerequisite**: ELEC 320. On demand.		

MECA 545	Integrated Automation Lab	1(0,2)
This lab explores PID control algorithms; digital controllers and their components; tuning methods and process control; diagnosis and error search; analog value processing; communication between two and more PLCs. **Co-requisite**: MECA 542. On demand.		

MECA 586	Mechatronics Drives	3(3,0)
Switched-mode converter, steady-state voltages and currents of step-down, step-up, inverting, and other power converters, power semiconductor devices in a switching converter, discontinuous conduction mode, solve converters operating in DCM, implement transformer isolation in a dc-dc converter, design and analyze the feedback systems of switching regulators, Design Project. **Prerequisite**: ELEC 320. On demand.		

MECH 422	Manufacturing Processes	3(3,0)
General overview of manufacturing; properties of materials; dimensions and tolerances; machining; casting; sheet metal forming; injection molding; thermoforming; plastic processing; fundamentals of process performance (rate, quality, cost, flexibility); variation and quality; sustainability; overview of additive manufacturing. Project. **Prerequisite**: MECH 320. Annually.		

MECH 470	Product Design and Development	3(3,0)
Idea generation; concept generation; concept selection; functional analysis; engineering design process for systems and components; economic consideration; reliability analysis; product safety; design project. **Co-requisite**: MECH 421. On demand.		

MECH 527	Modern Material Science	3(3,0)
Advanced coverage on metals and alloys; applications and processing of ceramics; characteristics, applications, and processing of polymers; surface properties enhancement; materials simulation; economics, environmental, and societal issues in material sciences; biomaterials and nano-scale materials. **Prerequisite**: MECH 223. On demand.		

MECH 570	Digital Manufacturing	3(3,0)
In this course the student will get an insight of diagnosing and correcting operational flaws; modeling and fabrication based on additive manufacturing technologies; automation technologies; production planning, process quality control; use of modern four-axis Computer Numerical Control (CNC) machines, 3D printers and up-to-date software programs including AutoCAD, Inventor, Solid Works, and VisualCam. **Prerequisite**: MECH 422 and MECA 541. On demand.		

MECH 571	Optimization in Engineering Design	3(3,0)
Problem definition, cost function and constraints; local vs. global methods; deterministic vs. stochastic methods; linear vs. non-linear programming; constrained vs. unconstrained; continuous vs. discrete; gradient-based methods; combinatorial optimization techniques; applications to various engineering problems (single/multi-objective); project. **Prerequisite**: MATH 421. On demand.		

Faculty List

Abdallah, Firas; Ph.D. in Computer Science, University of le Mans, 2009**.**

Alwan, Mohamad; Ph.D. in Microelectronics Optoelectronics and Systems, Rouen University, 2007.

Al Wardany, Riad; Associate Professor, Ph.D. in Civil Engineering, University of Sherbrooke, 2005

Arid, Amal; Instructor, Master in Computer and Electrical Engineering, AUB, 2010.

Chaaban, Ahmad; Professor, Ph.D. in Mechanical Engineering, University of Waterloo, 1985.

Berjaoui, Omar; Instructor, Master in Mechatronics Engineering, RHU,2011.

Diab, Mohammad; Professor, Ph.D. in Biomedical Engineering, University of Compiegne, 2007.

Diab, Nadim; Associate Professor, Ph.D. in Mechanical Engineering, American University of Beirut, 2013.

Fawaz, Khaled; Lecturer, Ph.D. in Automation and Industrial Engineering, USTL, 2009.

Fayssal, Iyad; Assistant Professor, Ph.D. in Mechanical Engineering, American University of Beirut, 2017.

Hajj Chehade, Rana; Assistant Professor, Master 2 in Civil Engineering, Lille University, 2015.

Hijazi, Toufic; Professor, Ph.D. in Electrical Engineering, Clarkson University, 1988.

Kaderi, Mohamad; Instructor, BE in Mechatronics, Rafik Hariri University, 2021

Kasab, Milana; Instructor, M.Sc. in Biomedical Engineering, Rafik Hariri University, 2021.

Koubeissi, Ahmad; Associate Professor, Ph.D. in Robotics and Automation Engineering, university of Lille, 2015.

Maatouk Maya; Instructor, M.Sc. in Mechatronics Engineering, Politecnico di Torino,2021.

Machaka, Muheiddein; Associate Professor, Ph.D. in Civil Engineering, Beirut Arab University, 2015.

Mrad, May; Instructor, M.Sc. in Civil & Environmental Engineering, Rafik Hariri University, 2018.

Moustafa, Ousama; Instructor, Ph.D. in Engineering, University le Havre,2008.

Nuwayhid, Rida; Lecturer, Ph.D. in Mechanical & Nuclear Engineering, University of London, 1989.

Reslan, Nada; Instructor, Master of Science in Structural Engineering, BAU,2012

Sabbah, Maher; Associate Professor, Ph.D. in Biomedical Engineering, University of Technology of Compiègne (UTC) France and Université Claude Bernard, Lyon, 2016.

Taha, Mohamad; Professor, Ph.D. in Electrical engineering, Aston University, 1992.

Zantout, Rached; Professor, Ph.D. in Communications Engineering, Ohio State University, 1994.

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