



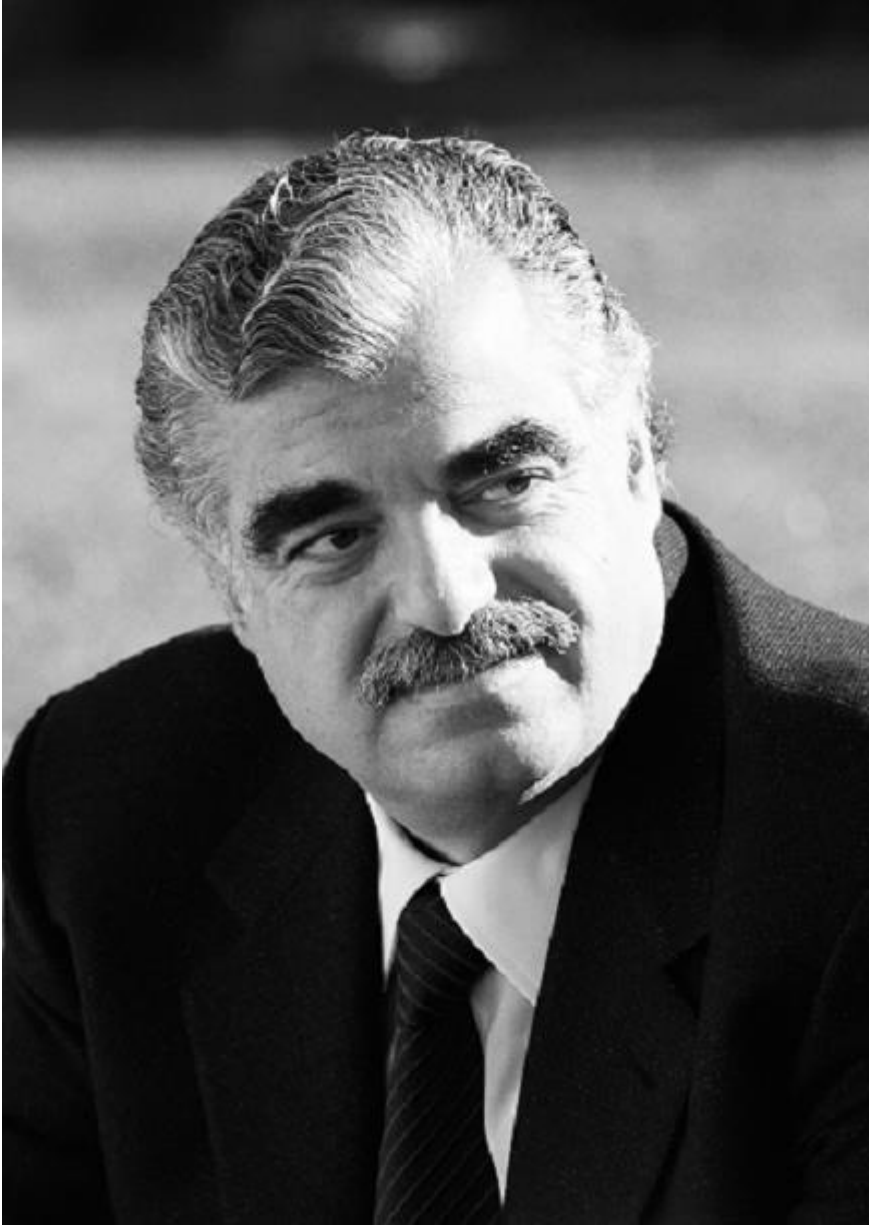
RAFIK HARIRI UNIVERSITY

Higher Education as it should be

Graduate Catalog

2016–2017

Mechref, Lebanon



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

Notice

Information in this catalog applies to the 2016-2017 Academic Year as of September 1, 2016. The University reserves the right to make changes without prior notice in programs, course offerings, academic requirements, and teaching staff as deemed to be in the best interest of students.

This catalog has been drafted to conform 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. Ignorance of the stated university, college and program regulations will not exempt students from the ramifications of their Failure to comply with them and the penalties that may incur.

Contact Information

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This catalog can also be viewed at www.rhu.edu.lb

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Message from the President

Higher education (HE) is in transition. Being a bridge to a better future, higher education institutions (HEI) need continuous maintenance to prevent sudden collapse. While demographic, social, and economic factors are at play in determining the future of HE, the plethora of technology tools in particular is driving HEIs to undergo fundamental structural changes. Technology, totally embraced by the generation that is born in its midst, is influencing almost every vital university function and experience: management of resources, design of the classroom, purpose of the library, life on campus, planning of space, modes of communication between students and instructors, teaching methods, learning styles, modes of knowledge attainment, and so on.

The fast pace of these changes, exacerbated by the high cost of integrating technology, changing public perceptions about quality education, growing number of HEI and knowledge providers, shrinking conventional markets for graduates, ineffective accountability measures, and the narrowing window to make important decisions leave HE planners perplexed. To keep pace and hopefully stay ahead of the competition requires wisdom, tenacity, and new thinking. Claims of quality education, stories of past successes, magical ads and spirited slogans are no longer adequate for people to beat a path to an institution's door. At a time our communities are becoming unrecognizable distant fragments of unforgiving reality, threatening what is essentially human, we say to our students that their presence here at RHU is an opportunity to decode the rapidly changing world around them, imagine a future they dream of and cultivate pathways to reach it. In the midst of tumultuous changes and challenges that threaten the existence of our society as we know it, we hope after having earned a degree, our students would be convinced that RHU was truly the "unforgettable choice" they made, where: the aim is symbiotic with the hopes of the nation; the purpose is clear – nurturing hopes and shaping dreams; the outcome that matters most is students' success; and the learning experience prepares for a lifetime of meanings.

Riad

Chedid

BOARD OF TRUSTEES

Mrs. Nazik Rafik Hariri, Chairperson
HE Charles Rizk
HE Ghazi Youssef
HE Adnan Mroueh
Mr. Raymond Audi
Dr. Daoud Sayegh
Dr. Abdul Hamid Hallab
Dr. Nahla Houalla
Mr. Mohamad El-Hout
Ms. Salwa Siniora Baasiri
Prof. Riad Chedid, Rafik Hariri University

ACADEMIC CALENDAR 2016-2017

Fall Semester 2015-2016

Jul 11-13	Orientation and Registration / New Students Fall 2016
Aug 1-15	Payment of Fall 2016 Tuition and Fees
Jul 6-8	Eid El Fitr/ Holiday*
Aug 29	Classes Begin
Aug 30-31	Drop and Add Period
Sep 11-13	Eid Al-Adha/ Holiday*
Oct 2	Hijra New Year / Holiday*
Oct 11	Ashoura Day / Holiday*
Oct 31-Nov 4	Advising Week / Spring 2017 for Continuing students
Nov 1	Founder's Day
Nov 7-11	Registration Week / Spring 2017 for Continuing student
Nov 9	Last Day to Withdraw from Courses
Nov 22	Independence Day / Holiday
Nov 30-Dec 1	Orientation and Registration / New Students Spring 2017
Dec 9	Last Day of Classes
Dec 12-13	Reading Period
Dec 14-20	Final Examinations Period
Dec 21- Jan 4	Payment of Spring 2017 Tuition and Fees
Dec 11	Prophet's Birthday/ Holiday*
Dec 25	Christmas / Holiday
Jan 1	New Year / Holiday

Spring Semester 2015-2016

Jan 6	Armenian Christmas / Holiday
Jan 9	Classes Begin
Jan 10-12	Drop and Add Period
Feb 9	Saint Maroon's Day / Holiday
Feb 14	H.E.P.M Rafik Al Hariri Commemoration Day
Mar 13-17	Advising Week / Summer–Fall 2017 for Continuing student
Mar 20-24	Registration Week / Summer –Fall 2017 for Continuing student
Mar 22	Last Day to Withdraw from Courses
Mar 25	Annunciation Day / Holiday
Apr 14-17	Easter / Latin & Greek Orthodox Holiday
Apr 21	Last Day of Classes
Apr 21	Fall 2017 Financial Aid Applications Submission Deadline
Apr 24-25	Reading Period

Apr 26-May 3	Final Examinations Period
May 4- May 18	Payment of Summer 2017 Tuition and Fees
May 1	Labor's Day/ Holiday
May 24	Commencement Exercise

Summer Semester 2015-2016

May 29	Classes and Co-op Work Experience Begin
May 30	Drop and Add Period
Jun 25-27	Eid El Fitr/ Holiday*
July 6	Last Day to Withdraw from Courses / Co-op
July 20	Classes and Co-op Work Experience End
July 24-25	Final Examinations Period

* Tentative dates pending moon sightings. The calendar shall be updated in due time to reflect changes in public and religious holidays.

DIRECTORY

	Location	Extension
Admissions Office	I 107	405/406/407
Bookstore	Block I	753
Central Laboratories	D-102b	554
College of Business Administration	G 101J	301
College of Engineering	C 103	501
College of Arts	F 105K	201
College of Sciences and Information Systems	I 201	701
Communication and Alumni Relations	I 101-102	755/754
Dorm Supervisor	A 112	112
Dean of Student Affairs	I 125	770
Quality Assurance and Institutional Advancement	I 219	783/799
Finance Department	Block E	424/416/418
Graduate Studies and Research	Block B	611
Gymnasium	Block G	330
Health Clinic	I 119	751
Help Desk	Block G	333
Human Resources	I 103	787/786
IT Service Department	Block G	333/334
Library	Block E	434/435
Media Center	I 101-102	755/754
Operator	Block E	0
President's Office	Block E	441/442
Purchasing and Procurement Department	I 111-112	743/744
Registrar's Office	B 102	615/616
Security		190/1/2/3/4/5
Store	Block I	752
Student Affairs Office	I 104	777
Support Services Department	I 110	740/741
Vice President for Academic Affairs	Block E	404
Vice President for Development and Information Technology	Block E	403
Vice President for Finance & Administrative Affairs	Block E	402

THE UNIVERSITY

Overview

UNIVERSITY ADMINISTRATION

Riad Chedid, President

Ahmad Smaili, Vice President for Academic Affairs

Hisham Kobrosli, Vice President for Development and Information Technology

Najib Arabi, Vice President for Finance and Administrative Affairs

Board of Deans

Ahmad Smaili, VP for Academic Affairs

Jamil Hammoud, Dean – College of Business Administration

Hisham Basha, Dean – College of Engineering

Mohamad Al Ladan, Dean – College of Sciences and Information Systems

Mohamad Diab, Dean of Students

Hiam Loutfi, Chair – Languages and Humanities Department

Admissions

Zeina Tannir, Director

Central Laboratories

Samir Berjaoui, Director

Communication and Alumni Relations

Rafal Tabaa Khayat, Director

Finance Department

Manhal Bou Karoum, Director

Human Resources Department

Doriah Naboulsi, Manager

Information Technology

Wassim Mallah, Manager

Library

Jamal Tabbara, Director

Quality Assurance, Institutional Effectiveness and Improvement

Toufic Hijazi, Director

Registrar

Nidal Khalaf, Registrar

Student Affairs

Mohamad Diab, Dean of Student Affairs

Support Services Department

Ahmad Sabeh Ayoun, Director

THE UNIVERSITY

History

The establishment of an educational institution, accessible financially and geographically 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 location for establishing a hospital and a university in collaboration with the University of Saint Joseph. However, the 1982 Israeli invasion led to the virtual 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, a non-profit organization whose major goal was to provide the 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.

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

Rafik Hariri University, whose aim is to provide affordable, high quality education and to supply knowledgeable and competent graduates to meet Lebanese and regional job market demands, became a reality and opened its doors for the first time on September 15, 1999, with the College of Business Administration, according to Presidential Decree 1947. It opened with a student population of 75. After its 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 by fostering a culture of quality, instituting authentic learning conditions, and supporting 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 a culture of quality by committing to academic excellence, due process and hard-work; set up learning conditions conducive to farming dreams, stimulating imagination and cultivating passion to forever learn; instill the values of responsible behavior, tolerance, and freedom of self-expression and thought; and align learning outcomes with emergent community needs to ultimately transcend students' potential, possibilities, and contribution beyond time and distance.

Values

When it comes to values, we do not merely pay lip service. We are indeed deeply committed to a number of core values that we uphold and fulfill.

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

Excellence. Offer a meaningful contribution to the development of knowledge and promoting excellence in teaching 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 of academic and civic life.

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

Purposeful Learning. Engage students in a learning experience congruent with the dreams of individuals and the needs of the community.

Location and Climate

RHU is located in Mechref, Damour, 20 kilometers south of Beirut. The campus sits on a hill overlooking the Mediterranean Sea, above the Mechref Village, a residential project with altitudes ranging from 30 to 560 meters above sea level. The climate is moderately cold from December to March and moderately hot from June to September.

The 54,000-m² campus has nine main buildings. Seven buildings are used for educational purposes, one for the administration, and one for faculty and student residences.

The lush greenness of the RHU campus creates a refreshing ambience for students pursuing their academic goals. The green lawns provide ample space for students to study, relax, and socialize. The mosaic of blue, green, and white – a blue sky, green lawns, and white buildings – of the RHU campus is itself splendor.

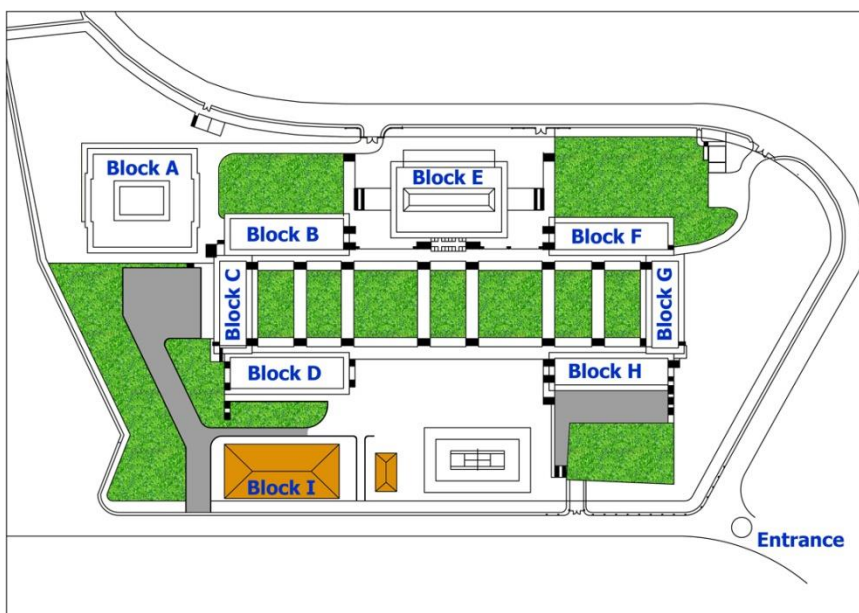
Directions and Map

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 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 Campus



Map of the RHU Campus

GRADUATE PROGRAMS AND DEGREES

Graduate programs at RHU aim to provide qualified students a graduate studies experience that helps them realize their potential as they seek to further their education. The College of Business Administration grants a general Master of Business Administration (MBA) degree and a Master of Business Administration (MBA) in Oil and Gas. The College of Engineering grants Master of Science (MS) degrees in six engineering programs

The number of credits to earn an MBA degree is 36, after completing the 99 credits required for a Bachelor of Business Administration degree.

The minimum number of credits to earn an MS degree in engineering depends on the earned undergraduate degree and on whether a student follows a thesis or a non-thesis path. According to the Ministry of Education and Higher Education (MEHE) decree, an MS granting program must ensure that a student completes a minimum of 155 credits beyond the Lebanese Baccalaureate or its equivalent. Therefore, a student who earns a Bachelor of Science degree from a 114-credit program must complete a minimum of 41 credits to earn a thesis-based MS degree. Meanwhile, a student who earns a Bachelor of Engineering degree from a 146-credit program (excluding Co-op credits) must complete a minimum of 9 credits to earn a thesis-based MS degree. Non-thesis track students must complete an additional three credits, for a total of 158 credits beyond the Lebanese Baccalaureate or its equivalent.

In addition to the above requirements, students who had earned a Bachelor of Engineering Technology (BET) degree from an **IUT** are required to take 24 undergraduate credits of remedial courses for the BET degree to become equivalent to a Bachelor of Science degree in engineering.

The programs and the number of credits required for graduation beyond a Bachelor degree are summarized below.

Minimum MS degree Requirements			
Undergraduate studies		MS Degree Minimum Credits Requirements	
Degree	Credits Earned	Thesis Option	Non-Thesis Option
Bachelor of Science	114 Credits	47 Credits	50 Credits
Bachelor of Engineering	147Credits	15 Credits	18 Credits

Details on the existing graduate programs, graduation requirements and pertinent regulations are presented are presented in this catalog.

ADMISSION

Zeina Tannir, Director of Admissions Office
Sawsan Sheik Younes, Associate Director of Admissions Office
Block I, Ground Floor, Room # 106
00 961 5 603090; Ext 405/406/407
www.rhu.edu.lb/admission

Admission to graduate programs is based on merit. It is offered to applicants holding undergraduate degrees from RHU or other recognized institutions. Students can apply to graduate studies for the summer, fall or spring semesters. Applications are available at the Admissions Office or may be downloaded from RHU's web site: www.rhu.edu.lb

The Admissions Office receives admission applications, communicates with the applicant to complete the application dossier, responds to inquiries, coordinates with the academic units and the University Graduate Studies and Research Committee, and conveys admission decisions and related stipulations to the applicant. Admission to a graduate program is granted on competitive basis and early admission may be granted to students with strong undergraduate records. Applications may be submitted via mail, email, or in person. 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/.

Deadlines

The applications to master's degree programs and decisions rendered by the departments and **concerned colleges** proceed according to the following timeline:

1. Applications for admission to the master's programs should be received by the following dates of every year for early consideration: April 15 for summer or fall admission and November 15 for spring admission;
2. Applications received after the deadlines will be considered on a rolling basis;
3. A complete application must include at least two letters of recommendation from professors or supervisors of the applicant and an official transcript including at least the end of the first semester of the senior year or its equivalent;
4. Admission decisions on applications received by the dates specified in item 1 above are to be announced by the following dates: April 30 for summer or fall admissions and November 30 for spring admissions;
5. Potential students are given one month of the notification date to decide on accepting admissions and the assistantship, if offered, or risk losing the latter;
6. Students who are eligible to be admitted on probation will be notified by the April 30 and November 30 deadlines;

Admission Criteria

An applicant with a bachelor degree from RHU or other recognized institution will be admitted to graduate studies at RHU if the college to which the applicant proposes to study deem the applicant has high potential for success in the graduate program. Applications are reviewed and final recommendations are made by the concerned college on a case by case basis. An applicant who has received the bachelor degree from RHU is exempted from taking the GRE or the GMAT.

Depending on the record, an applicant is admitted either on a regular basis or on probation.

Regular Admission

Regular admission to a Master program is granted to a student who has:

- Attained an average of 80 at RHU or its equivalent at a recognized institution as determined by the college;
- Adequate English proficiency as established by the University;
- At least two letters of recommendation from faculty or supervisors familiar with the academic ability of the applicant.

Note that the English Proficiency requirement may be waived for students having a bachelor degree from an English teaching institution.

Admission on Probation

Acceptance on Probation may be granted to an applicant who meets the regular admission requirements stated above but has an undergraduate GPA of 75 or above at RHU or its equivalent at other universities as determined by the college. Students admitted on probation may be requested to take background courses to strengthen their prospects of success in graduate studies. Background courses do not count as credit toward completing the graduation requirements.

A student accepted on probation must complete a minimum of 12 credits of background (in case they are required) and graduate level courses, or nine credits of graduate courses, in no more than two regular semesters, pass all courses and attain a minimum grade of 80 in each course to remove the probation status.

Special Admission Consideration

A holder of a bachelor degree who does not meet the RHU graduate admission criteria but has considerable practical experience is requested to sit for an **interview with the College Graduate Studies Committee (CGAC) formed and chaired by the Dean**. Based on the assessment of the candidate's aptitude for graduate studies, the **CGSC** may make one of the following recommendations:

- ◆ Accept the applicant on probation and require him/her to take a set of background courses and attain a minimum average of 80 in each course to continue as a regular student.
- ◆ Require the applicant to take the RHU Graduate Entrance Exam (GEE) prepared to assess the candidate's competence level in Mathematics and the discipline study area. Based on the results of the exam the ad hoc committee recommends that the candidate be accepted on probation, take a set of courses and earn a minimum score of 80 in each course to continue as a regular student.
- ◆ Require the applicant to submit GRE scores for admission to the College of Engineering or the GMAT scores for admission to the College of Business Administration and based on the acquired score the **CGSC** identifies the candidate's areas of weakness or gaps of knowledge and recommends that the candidate takes a set of background courses to improve his/her competency level.

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: 600 on the Institutional TOEFL (ITP), 83 in the Internet Based TOEFL (IBT), **380 on the Writing section of the old SAT I, 22 on the Writing section of the new SAT I** or 6.5 on the academic IELTS. Students who fail to attain the requisite score will be required to enroll in the Intensive English Language Program (IELP) to achieve the necessary English proficiency. The IELP consists of four levels and the student is placed in the appropriate level based on the English proficiency examination score. After completing the IELP program students must also take ENGL 210 and ENGL 217.

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

Applicants may choose to sit in for the RHU administered TOEFL or may contact the AMIDEAST Office in Beirut (Solidere District, Riad Solh Street, Bazerkan Building– Tel: 01/989901) to register for the TOEFL or SAT Exams. When registering for TOEFL, SAT I and SAT II, applicants must specify the RHU code 4438 in order for the results to be sent to the RHU Admissions Office. **Students interested in taking the IELTS test may register for it at RHU.**

Application Package

To be considered for admission to graduate studies at RHU, applicants must submit the following documents (RHU graduates are not required to submit the documents of items 1 through 7):

1. A certified copy of the undergraduate degree;

2. Official transcripts and the university catalog;
3. A certified copy of the Lebanese Official High School Certificate or its equivalent;
4. Minimum score on one of the following English language proficiency tests: (a) TOEFL - 557 on the Institutional Test or ITP, or 83 on the Internet Based Test or IBT; (b) 380 on the Writing section of the old SAT I, 22 on the Writing section of the new SAT I; or (c) IELTS - 6.5. Admitted students with lower than required English test scores must enroll in the Intensive English Program. RHU graduates and applicants coming from a recognized institution of higher education where English is the language of instruction may be exempted from taking the English exam;
5. Original Civil Status Record (for Lebanese applicants);
6. Photocopies of passport and residence permit (for non-Lebanese Applicants);
7. Three identical recent passport-size colored photos;
8. Two letters of recommendation;
9. A non-refundable application fee of LL 100,000 paid in cash at RHU or by a certified check payable to "Rafik Hariri University".

Graduates of Technical Institutes

Holders of a Bachelor of Engineering Technology from a technical institute are eligible to join the MS program in an engineering field related to the diploma. To be accepted, the MEHE requires that a student must take 24 credits of undergraduate courses to make the level equivalent to that of Bachelor of Science in engineering degree. The grades achieved on the remedial courses shall not be used in calculating the CGPA.

Tuition Fees

The University tuition fees are determined by the Board of Trustees on an annual basis. Tuition and fees may be increased annually without prior notice. Currently applied tuitions and fees are 585,000 per credit.

Other Fees

Type of Service	Fees in L.L.
Application for joining the University*	100,000
Enrollment deposit – upon acceptance*	250,000
NSSF	202,500
Campus Life	60,000
Internet	125,000
Late Registration	120,000
Late Payment (first month)	120,000
Late payment (subsequent month)	60,000
Transportation – optional	
Regular Shuttle – Fall or Spring Semester	600,000

Regular Shuttle - Summer Term	300,000
Campus Shuttle - Fall or Spring Semester	180,000
Campus Shuttle - Summer Term	90,000
Parking Fee - Fall or Spring Semester	50,000
Parking Fee - Summer Term	25,000
Dormitory/Housing - optional	
Double room in a shared apartment- Fall or Spring Semester	1,050,000
Double room in a shared apartment - Summer Term	525,000
Registration	225,000
Deposit	300,000

* Nonrefundable

The background undergraduate credits taken by graduate students will be assessed the tuition fees of undergraduate credits.

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 register 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 by the announced deadlines in one of the following forms: At one of Bank Med branches or On-line or via bank transfer. Students must have the statement of fees on hand when payment is made to ensure proper crediting to the student's account. Statement of fees is available on RHU website.

Students who are unable to make full payments by the billing dates may benefit from the University installment payment plan. The student needs to visit the Finance Department and make the proper arrangement before the payment deadline.

Tuition Refund

A student who had registered and paid the tuitions for a course and then drops it during the drop/add period is entitled for a full refund. Students who do not formally drop a course during the drop/add period will be responsible for payment of all tuitions and fee 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, he/she is eligible for a refund of 75% of the semester paid tuition if the withdrawal is approved before the classes begin, 50% if the withdrawal is approved during the drop/add period, and no refund for withdrawing after the drop/add period.

Transfer of Credits

A graduate course taken beyond the requirements for the bachelor's degree at RHU or other recognized institutions may be transferred for graduate credits at RHU provided that the course grade is 75 or above. A maximum of six credits may be transferred.

Approval of the department concerned and the CGAC is required for all transfers.

Transfer Graduate Students

Graduate credits earned in a recognized institution other than RHU can be transferred subject to the following rules on a case-by-case basis:

- Attained a grade of 80 or above;
- A maximum of 12 credits is transferred for graduate credits beyond a Bachelor of Science in engineering or a Bachelor of Business Administration.

Transfer of Credits from One Master's Degree to Another

Graduate courses taken beyond the courses required for a master's degree at RHU may be transferred to another master's degree program at RHU. The following conditions apply: (1) The applicant earns a grade of 80 or above in the courses to be transferred; (2) A maximum of six credits may be transferred if courses are relevant to the new graduate program.

Approvals of the department concerned and the GSRC are required for all transfers.

REGISTRAR'S OFFICE

Nidal Khalaf, Registrar
Amani Baasiri, Assistant Registrar
Block B, Room 102.
00961 5 60390, Ext: 616/617.
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 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 to prepare 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 Student Services section for more information on NSSF matters.

Passport and Visa

Expat students admitted to RHU must have their passport 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

Once accepted in a graduate studies program, the following regulations apply:

Period of Study

All requirements for the master's degree must be completed within a maximum period of four years after admission to the graduate program. Extension beyond the maximum allowed period of study requires justification and approval by the **CGSC and the VP of Academic Affairs**.

Orientation

During the first semester of graduate work, the concerned department will arrange for a meeting to explain the graduate studies policies and help graduate students get acquainted with the faculty and their research interests. This is intended to help expedite students' selection of a project topic and advisor.

Supervision

During the first semester of graduate studies at RHU, the department concerned shall designate an interim academic adviser to guide students in planning a course of study for the semester and acquaint them with the graduate studies policies and procedures. By the end of the first semester, each student must choose an advisor, prepare a plan a study and complete the GS-1 form.

Courses and Grades

Courses taken as part of a student's graduate study program fall in one of two categories: background courses and graduate courses.

Background Courses

Students accepted to a graduate program may be requested to take a set of background, usually undergraduate courses that do not carry graduate credits but are required to make up for any deficiencies in the student's background. The following conditions apply to background courses:

- The number and level of prerequisite courses are part of the plan of study as set by the college at the time of admission.
- A minimum grade of 80 must be earned in each course.
- A student may repeat a course for which a grade less than 80 is earned only once
- A maximum of two background courses may be repeated for grade improvement.

Students who finish the IELP program must also take ENGL 210 and ENGL 217.

Failure to meet these conditions results in the student's automatic dismissal from the graduate program.

Graduate Level Courses

The minimum passing grade of a graduate course is 70. Students in the graduate program are required to maintain a cumulative average of at least 80 in all courses taken for graduate credit.

Course Load

The maximum course load for a graduate student is 12 graduate credits per semester. Students on probation can register a maximum of 9 credit hours per semester. Students who are employed during their graduate studies are strongly advised not to take more than six credits.

Plan of Study

By the end of the first semester, a graduate student and her/his Academic Advisor must complete the Proposed Program of Study form (GS-1) which includes a tentative plan of study. This program of study is submitted to the Chairperson of the concerned Department for approval then to the Dean of the College. Once approved, this document becomes part of the student's permanent record.

Academic Standing

Regular Standing

Regular standing status is attributed to a graduate student who maintains a cumulative GPA of 80 or above and has not failed any course.

Warning

A student receives an academic warning if his/her SGPA in any regular semester falls below 75 while maintaining a CGPA 80 or above and has not failed any course.

Academic Probation

Academic Probation is applied to a student who fails a course taken for graduate credit and/or has a CGPA less than 80. Academic probation must be removed in two regular semesters after being placed on probation. During this period, all failed courses must be repeated and successfully passed. If a failed course was not offered during the probation removal period it must be successfully repeated when first offered.

Repeated Courses

A graduate course may be repeated only once.

Dismissal

Dismissal from the graduate program applies to a student who:

- Attains a Semester GPA less than 70;
- Fails to remove probation in two consecutive regular semesters irrespective to the number of earned graduate credits;
- Failed a course more than once.

Graduate Assistantship

Rafik Hariri University (RHU) offers a limited number of merit-based assistantships to graduate students under the Graduate Assistant (GA) Program every term, excluding summer. This form of scholarship provides limited financial support to qualified graduate students for services they render to the University. Refer to the chairperson of the department for more information and submission of application.

Graduation Requirements

To be eligible for graduation with a master's degree, a graduate student must have:

- Completed the credit hours of course work required by the program;
- Completed the thesis/project requirements and submitted a copy of the thesis/project to the library;
- Met the period of study requirements;
- Passed all courses; and
- Attained a CGPA of at least 80.

Note: Please refer to the related college section for additional college requirements that may apply.

LIBRARY

Jamal Tabarah, Director of Libraries

Block E

00961 5 603090; Ext: 434/435

www.rhu.edu.lb/library

Rafik Hariri University Library provides students, faculty and staff the resources and services they need to succeed in their educational and research undertakings. The library building occupies more than 650 square meters of space offering users ample study and computing commons; halls for meetings, seminars and conferences; classrooms; faculty development centers; praying rooms; executive meeting rooms. The library holds collections in The Arts, Humanities, Computer, Social Sciences, Business and Economics, Accounting, Finance, Management, History, Engineering (Civil, Mechanical, Mechatronics , Biomedical and Electrical) Education, Literature and Languages News and Newspapers, Science and Technology, and History. 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. Current collections include more than 6800 printed book items and 115,200 electronic books covering 160 subject area, 7180 full text e-journals, and 40,000 full text dissertations and theses, 13,000 case study and 900 reports. Use of these resources is subject to copy right law and the license agreements that RHU signs with the e- resources providers. The Library has a modern IT infrastructure which includes:

- An integrated library system (SIERRA) that embeds all library functions, services, and auxiliary tools that enable access to resources on and off campus.
- Workstations located in the references area and connected to the Internet to access online catalogs, e-databases, Turnitin and other resources.
- An Internet lab equipped with networked computers loaded with the latest applications.
- Multi-media rooms equipped with state-of-the-art tools, computers, video projectors, data shows, CD writers, scanner, etc.
- Wireless connectivity covers all library spaces.

RHU continues to develop and improve 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 role; and improve community outreach and branding.

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 form of books and periodicals, the library holds a

collection of electronic resources and multimedia materials. The library home page provides links to the full-text online databases, e-journals, e-books, research databases and online catalog. 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 in accordance with International standards and best practices. All print resources are arranged and catalogued according to Dewey Decimal Classification 21 and MARC21 formats and standards which are used to build bibliographic databases.

Library Services

The library staff assist users in using library resources and respond to enquiries received in person, by phone, by email or through the library home page electronic forms. The staff also organize 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 putting books and other materials on reserve for use by students inside the library premises for a period of time. A special arrangement is made with the American University of Beirut libraries, Jafet library and Saab medical library, to allow all RHU users access the materials which are not available at RHU Library. 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 photocopying machines.

INFORMATION TECHNOLOGY DEPARTMENT

IT Helpdesk

00961 5 603090 Ext: 333

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. The IT Department actively engages the teaching and learning processes by introducing multimedia solutions and mobile technologies, creating smart classroom environment, and supporting effective utilization of the learning management system. The IT Department also supports administrative divisions in adopting technologies that improve users' productivity in executing University functions, and manages all University information systems. Additionally, the IT Department is responsible for maintaining, and upgrading all hardware, software and applications dedicated to running University academic and administrative functions. IT Department also engages in infrastructure planning and maintenance and in supervising 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 a large number of 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, student and faculty dorms. The Gigabit Ethernet fiber-optic backbone network is connected to the Internet through a 30 Mb/s line to provide the necessary bandwidth for quality services. The network consists of over 840 voice/data points and includes more than 40 wireless access points covering all university buildings. At present, nearly 400 computers are connected to 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: Student Information System (CampusVue), student accounting, finance, payroll, human resources systems, library and archiving systems, staff work log system and 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 important communication tool for the University and the source of vital information for prospective and current students, as well as faculty and staff, among other audiences.

Management of the website through a full 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: Student Information System, Moodle, Online Payment System, Surveys and Voting, Alumni Section, Latest Press Releases, Events and News, Careers, Downloadable Applications and much more.

Instructional and Classroom Technologies

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

IT Helpdesk Services

The IT Helpdesk team provides a wide range of support services for the students, faculty and staff at RHU in order 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 their main communication channel with RHU faculty and staff members. TMS provides a transparent and interactive platform for staff and faculty members to send their requests and report incidents, and to follow up and keep record of their tickets. Also, TMS provides a space for end users to provide satisfaction feedback on the service they are receiving from ITC personnel in each ticket.

CENTRAL LABORATORIES

Samir Berjaoui, Director of Central Labs

Block C

00961 5 603090, Ext. 554

www.rhu.edu.lb/laboratories

Learning by doing is the learning mode that influences knowledge retention the most. Furthermore, experimental verification plays a central role in understanding theories and their applications and in advancing knowledge through discovery. Complementing theoretical knowledge with applied skills and competencies also enhances students' potential to think critically, discover and innovate. Accrediting bodies in almost all fields have identified practical skills as an important element of curricular outcomes. For all these reasons, access to appropriate and adequate lab facilities is guarded as a fundamental student right at Rafik Hariri University (RHU).

RHU provides students the applied experience through more than 15 modern laboratories and workshops that support learning and research activities in the colleges of Sciences and Information Systems and Engineering. The labs provide the learners and researchers the optimal space, tools and support that enable them to transform ideas into meaningful innovations that advance University mission and contribute to community development.

The labs director assisted by the lab engineers are dedicated to: Create supportive and safe conditions for the learners and researchers; assist the academic units in the evaluation and procurement of contemporary lab technologies and scientific equipment; maintain safe lab environment; organize space and lab assets to maximize the efficacy of available resources; maintaining and updating inventory of lab assets; institute sustainable practices responsive to environmental concerns; engage in planning to continuously improve the lab conditions and experience; accommodate the testing needs of external entities in search for answers; institute quality management practices in conformity with international standards; facilitate knowledge share and transfer between the University and the outside world; and offer training opportunities to faculty and students.

QUALITY ASSURANCE AND INSTITUTIONAL ADVANCEMENT

Dr. Toufic Hijazi, Director

Ms. Mirna Talhouk, Assistant Director

Block I

Phone: 00961 5 603090, Ext. 799/783

gaia@rhu.edu.lb

www.rhu.edu.lb/gaia

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 aim of the unit is to improve institutional effectiveness, facilitate continuous improvement, support shared decision making, and assure attainment of aspired excellence in all areas of the university. The QAIA unit is responsible for the following duties:

- 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 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 audit to monitor performance and improve related practices.

STUDENT AFFAIRS

Dr. Mohamad O. Diab, Dean of Student Affairs

Mrs. Sahar Hallak, Student Affairs Officer

Block I

00961 3 5603090 Ext. 770/777

Dso@rhu.edu.lb

www.rhu.edu.lb/studentaffairs

The Office of the Dean of Student Affairs is responsible for many functions that serve to support the nonacademic aspects of University life that improve students' potential of academic success and help them attain a meaningful holistic experience. The Office manages students clubs and societies, promotes athletic and creative activities, organizes cultural events, oversees housing facilities, provides counseling services, holds students' elections and organizes student orientation 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 Office of the Dean of Student Affairs works closely with students 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 are able to advance a cause, and practice a hobby they are passionate about. In so doing students have the opportunity to connect with like-minded peers, build friendships, and develop leadership skills.

Counseling and Coaching

The Office of the Dean of Student Affairs aims to create conditions that promote students' social and psychological comfort essential 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 students' 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 us at: Dso@rhu.edu.lb or 05/603090, Ext: 777.

Student Representations

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

Student Faculty Committee (USFC) were established to guarantee that students' voice, 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 and the USFC in a transparent and democratic manner.

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 experience to international students and local 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 a broadband WiFi coverage. A shuttle bus runs to and from Damour's highway serving students who wish to spend time off campus. The University is keen to making the living experience on campus an opportunity to strengthen ties and build lifelong friendships among all students. The Dean of Students Office organizes sports, cultural and social events exclusive for students living on campus. For more information on housing services please contact us at: atmehns@rhu.edu.lb or 05/603090, Ext: 741.

Athletic and Recreation

The indoor sports center and outdoor tennis, football and basketball courts at RHU provides 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 Coach Khaled Baba at: babakk@rhu.edu.lb or 05/603090, Ext: 330.

The Ushers

This program trains students' volunteers and involve 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: dso@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 service is 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 bus schedule please contact Nada Atmeh at: atmehns@rhu.edu.lb or 05/603090, Ext: 741.

Student Centers

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

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 sit in areas to enjoy a meal in the picturesque natural outdoors. Vending machines offering snacks and drinks are placed in various university buildings.

Health Care

The University Medical Clinic has a resident nurse that provides RHU students, faculty and staff preliminary healthcare services round the clock. The clinic is located in Block "I" next to the bookstore. Ambulance services are also available round 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 to be informed of any modifications thereafter;
- Receive constructive feedback on course work within a reasonable timeframe;
- Be assessed on the merits of your academic performance without prejudice or other discrimination;
- Insure the confidentiality of academic and personal information;
- Access all information and documents to which you are entitled;
- Express opinion and convey grievances without fear of retribution; and
- Protest 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 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 to 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 to 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 so doing they will:

1. Work hard and intently engage the educational experience;
2. Speak out in a respectful manner 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 own 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; and
10. Adhere to the university bylaws and policies and assist in implementing them.

COLLEGE OF BUSINESS ADMINISTRATION

Officers of the College

Riad Chedid President
Ahmad Smaili Vice President for Academic Affairs
Jamil Hammoud Dean

Contact Information

Ms. Lydia Hyder
Administrative Assistant
Building G, Room 101-G
Phone: 961 05 603090, Ext. 301
Email: da_bus@rhu.edu.lb

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 seven undergraduate business programs in Accounting, Business Computing, Finance and Banking, Human Resources Management, Management, Marketing, Marketing and Advertising. In addition, the College offers a graduate MBA program in general business. Moreover, the CBA takes pride in being the first in Lebanon and the Arab World to offer a graduate MBA program with specialization in Oil and Gas Management.

The faculty is active in applied research in a number of business 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.

Finally, the CBA distinguishes itself by its systematic Co-op 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 highlight and raise 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 conduct its affairs in the spirit of teamwork and collaboration. Furthermore, the College opens up 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

Learning 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:

Technical Know-How

Students will become proficient in up-to-date theories, applications, best practices and other dimensions of their chosen area of specialization.

Knowledge of Main Business Functional areas

Students will acquire basic and fundamental knowledge of main business functional areas, necessary for them to understand the general business environment and the interrelationships among the various functional areas of business such as management, marketing, finance, information systems etc.

Leadership and Initiative

The College's programs will open up structured and unstructured opportunities for students to acquire knowledge and skills in leading and taking responsibly for initiating actions and projects.

Hands-On Applications

The College will open up structured opportunities for students to gain a hands-on understanding of the business environment and to apply what they learn in real world companies.

Analysis and Critical Thinking

Programs and activities in the College will involve learning settings which require students to learn and practice analytical and critical thinking tools and methods such as modeling, identification of cause and effect, associations, integration, synthesis, inquiry etc.

Effective Communication

Students will learn and demonstrate abilities to communicate orally and in writing in various professional environments and settings. Effective communication will include presentations, proposals, reports, dialogue etc.

Working Knowledge of Information Technology

Student competencies will be enabled by the development of a working knowledge of information technologies adequate to meet the challenges of the information technology and telecommunication revolution. This enablement will include both content and delivery of teaching and learning wherever is appropriate.

Ethics and Social Responsibility

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.

MBA PROGRAM

Program Overview

The Master of Business Administration (MBA) program at the College of Business Administration (CBA) is a graduate studies program, carefully crafted and continuously reviewed and updated, to allow students interested in advanced studies, to pursue their ambitions, within the framework of adding value to the betterment of society and humanity.

The program blends contemporary theories with real world applications and best practices, in the context of international standards and expectations. Accordingly, teaching methods and approaches emphasize the case method, learning by doing, and thoughtful integration of online and information technologies

Moreover, the program's breadth and depth is designed to insure that graduates may join the business world upon graduation, or go on to pursue more advanced academic and/or applied studies.

Mission

The MBA program's mission is to create a sustainable learning environment conducive to developing professional managerial leaders, able and willing to add economic and social value to society and humanity, in whatever contexts they live or serve.

Learning Goals and Objectives

Managerial Dimension

Goal	Demonstrate conceptual and theoretical knowledge of contemporary and modern management
Objectives	<ul style="list-style-type: none"> - Explain managerial roles, functions and theories - Evaluate the external and internal environment impacts on managers - Demonstrate the ability to plan, organize and control operations

Professional Dimension

Goal	Demonstrate effective communication skills, and ability to tackle business problems.
Objectives	<ul style="list-style-type: none"> - Prepare and deliver presentations, project and research reports - Apply appropriate problem solving tools to various business problems

Leadership Dimension

Goal	Demonstrate knowledge of modern leadership theories and patterns of group and individual behavior in organizations
Objectives	<ul style="list-style-type: none"> - Compare and contrast modern leadership theories - Identify examples and cases of known patterns of organizational behavior

Economic Value Dimension

Goal	Demonstrate ability to integrate aspects from various functional domains of business.
Objectives	<ul style="list-style-type: none"> - Identify and assess the various functional aspects of a business case or situation

Social Value Dimension

Goal	Demonstrate awareness of the necessity to contribute to the betterment of society.
Objectives	<ul style="list-style-type: none"> - Discuss how business can contribute to society's wellbeing. - Identify main principles of good governance

Specialization Options

Students admitted into the MBA Program may choose their emphasis to be: General Business Administration or Oil and Gas Management. An undergraduate degree in business is not necessary to pursue studies in either of the two emphasis areas, as background and/or remedial courses could be given to compensate for possible lack of fundamental business knowledge, in accordance with the admission requirements specified below.

Admission Requirements

All applicants to the MBA program must first satisfy the university graduate admission requirements specified in in this bulletin in.

Regular Admission

Applicants who have a Bachelor of Business Administration degree or its equivalent in any business area and satisfy the university graduate admission requirements for regular admission will be granted a regular admission status into the MBA program, and will be exempt from any background and/or remedial courses.

Admission on Probation

Applicants admitted on probation into either one of the two emphasis options may have to take up to three background and/or remedial courses, in addition to the MBA program requirements, to solidify their chances of successful completion of the MBA program. The number and nature of background and/or remedial courses are determined by the College's graduate admission committee on a case by case basis, depending on the strength of the applicant's file, professional work experience and undergraduate transcript.

Admission for Students with non-Business Undergraduate Degrees

Applicants with undergraduate degrees in areas other than business may have to take up to five background and/or remedial courses, in addition to the MBA program requirements, to ensure that they have the necessary business foundational knowledge for successful completion of the MBA program.

In general, the five courses include one foundational course in each area of Accounting, Finance, Economics, Management/Marketing, and Quantitative Methods. The number and nature of background and/or remedial courses are determined by the College's graduate admission committee on a case by case basis, depending on the strength of the applicant's file, professional work experience, and undergraduate transcript.

Graduation Requirements

In addition to the University requirements stipulated in the general section of this catalog, the following graduation condition must also be met before an MBA is granted: A student may not graduate if he/she has more than two courses in which a grade less than 80 were attained.

Program Requirements

MBA program requirements consist of mandatory core business knowledge courses (18/21 credits), elective specialization courses (12/15 credits) and an MBA capstone research project (3 credits). Moreover, students majoring in oil and gas management are required to complete a practicum of 1 to 2 month practical training period at various petroleum industry companies

and organizations. All in all, students are required to successfully complete 36 credits to graduate.

Mandatory Core Business Knowledge Courses (18/21 Credits)

Course	Title	Credits
BADM 505	Business Research Methods	3
BADM 515	Quantitative Modeling for Business	3
BECN 500	Applied Business Economics	3
BFIN 520	Corporate Financial Planning	3
BMGT 500	Strategic Planning and Business Policy	3
BMKT 510	Strategic Marketing Management	3

In addition to the above six mandatory courses, students on the General Business Administration track must take BACC 500 - Managerial Accounting, and students on the Oil and Gas Management track must take BACC 505 - Accounting for Oil and Gas.

MBA Research Project

Students in any of the MBA programs are expected to complete their MBA studies by successfully completing a capstone research project. The topic of the project is selected by the students and the project advisor and expected to involve research on a pertinent contemporary issue. The student must present his/her work in a formal report.

Study Plans

MBA: General Business Management

Course	Title	Credits
Year 1, Fall Semester (9 Credits)		
BECN 500	Business and Managerial Economics	3
BADM 505	Business Research Methods	3
	Business Management Elective	3
Year 1, Spring Semester (9 Credits)		
BFIN 500	Corporate Financial Planning	3
BACC 500	Managerial Accounting	3
	Business Management Elective	3
Year 2, Fall Semester (9 Credits)		
BADM 510	Quantitative Modeling for Business	3
BMGT 500	Strategic Planning and Business Policy	3
	Business Management Elective	3
Year 2, Spring Semester (9 Credits)		
BMKT 510	Strategic Marketing Management	3
BADM 590	MBA Research Project	3

	Business Management Elective	3
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MBA: Oil and Gas Management

Year 1, Fall Semester (9 Credits)		
BECN 500	Business and Managerial Economics	3
BADM 505	Business Research Methods	3
BMGT 530	Overview of the Global Oil and Gas Industry	3
Year 1, Spring Semester (9 Credits)		
BFIN 500	Corporate Financial Planning	3
BACC 505	Accounting for Oil and Gas	3
BECN 525	Energy Policy and Economics	3
Year 1, Summer (0 Credits)		
BADM 585	Practicum	0
Year 2, Fall Semester (9 Credits)		
BADM 510	Quantitative Modeling for Business	3
BMGT 500	Strategic Planning and Business Policy	3
BMGT 510	Advanced Project Management	3
Year 2, Spring Semester (9 Credits)		
BMKT 510	Strategic Marketing Management	3
BADM 530	Oil and Gas Law, Contracts and Negotiations	3
BADM 595	MBA Research Project in Oil and Gas Management	3

Description of Courses

Descriptions of these courses are given below.

BACC 500	Managerial Accounting	3(3,0)
This course investigates the important role accounting systems and information play in the management, planning, control and decision making of businesses. Topics include cost concepts, behavior and estimation; theory of constraints; cost-volume-profit analysis; activity based costing, capital budgeting and profit planning.		

BADM 505	Business Research Methods	3(3,0)
This course is about using business research to support business and management decisions or pursue more advanced graduate studies in business. It covers mainly the development, implementation, analysis and reporting of a research proposal. While the course covers qualitative research, it places emphasis on quantitative research in general and surveys in particular.		

BADM 515	Quantitative Modeling for Business	3(3,0)
This course introduces students to the use of management science to support the business		

decision making process. The focus is on quantitative tools and techniques that are used to facilitate decision making such as linear programming, transporting problems, project management, inventory models, waiting line modes, decision analysis, and forecasting.

BECN 500	Applied Business Economics	3(3,0)
Business Economics combines microeconomic tools with management methods for the purpose of effective decision making. It mainly covers quantitative demand analysis, optimization, consumer behavior, production, cost analysis, market structures and pricing.		

BFIN 520	Corporate Financial Planning	3(3,0)
This course exposes students to the financial management of the firm for the purpose of value maximization. That includes capital budgeting, capital structure and working capital management. The course starts with an intensive review of main corporate finance principles, followed by advanced level coverage of capital budgeting, capital structure and leverage, dividend policy, long term debt, financial forecasting and working capital policy.		

BMGT 500	Strategic Planning and Business Policy	3(3,0)
This course offers students deep insight into the strategic management process and its influence on the competitive advantage of an organization. Students will develop a comprehensive management viewpoint that integrates their knowledge of specific business functions and enables them to formulate and implement strategy. The course covers topics like vision, mission and objectives, environmental analysis, strategy formulation, implementation, and evaluation.		

BMKT 510	Strategic Marketing Management	3(3,0)
This course is an immersion in the core principles and practices of successful marketing plans and strategies. Topics include creating a marketing strategy in the context of overall business strategy, exploring the marketing mix, competitive dynamics, value pricing and integrating digital, brand and business strategies. The course places emphasis on customer relationship management and turning Big Data into value and profits.		

BACC 505	Accounting for Oil and Gas	3(3,0)
This course covers the fundamentals of oil and gas accounting. Topics include non-drilling exploration costs, drilling and development costs, proved and unproved property costs, asset retirement and asset impairment, oil and gas revenue accounting, oil and gas taxation and oil and gas disclosures.		

Elective Courses - General Business Management Program (12 credits)

Students in the general business management program elect four specialization courses, in addition to the mandatory core business knowledge requirements detailed above. Below are a number of elective specialization courses to choose from, along with their descriptions.

BECN 505	Globalization and International Business	3(3,0)
This course offers a thorough conceptual understanding of globalization and its implications on business and economic policy making. In addition to pointing out the challenges and opportunities globalization imparts, the course examines the interconnectedness between globalization and markets, governance, and global business and economic policy.		
BECN 515	Environmental Economics	3(3,0)
This course will focus on the balance between the environment and economic prosperity. Due consideration is given to the efficient and equitable use of environmental resources such as air, water, land, parks and wildlife. The use of such resources is examined from a number of perspectives including the market, efficiency, equity and government policy.		
BECN 520	Emerging Markets	3(3,0)
The course contributes to the understanding of the trend for transformation towards open market economies while building accountability within the system. This includes the reform of the price system including prices in the labor market, exchange rate regimes, as well as legal reform that cover basically business laws to enhance competitiveness and equal opportunities.		
BFIN 505	Portfolio Theory and Investment Analysis	3(3,0)
This course aims to cover modern portfolio theories and asset allocation models and methods for the purpose of an effective investment decision. It covers investment strategies and management processes, investment short and long term objectives, financial instruments selection and timing, trading practices, performance evaluation, the Capital Asset Pricing Model and the Efficient Market Hypothesis.		
BFIN 510	International Business Finance	3(3,0)
This course covers the environment of international financial management and country risk analysis, foreign exchange and derivatives markets, and FX risk management. It also deals with ways to finance the multinational corporation and manage its working capital. In addition, it covers foreign investment analysis with special emphasis on FDI. The course includes an in-depth review of several contemporary case studies		
BFIN 515	Commercial Bank Management	3(3,0)
The emphasis of this course is on commercial bank management policy and decision making. Analysis focuses on advanced asset-liability management approaches and addresses banking risk management issues such as interest rate, liquidity, credit, operational and capital adequacy. Topics include, performance, maturity, duration and gap management		
BMGT 505	Management Leadership and Internal Organization	3(3,0)
This course examines how successful organizations use management to convert strategy into reality. It describes the levels of management, the skills of managers and their functions, and elaborates using, contemporary tracks of management, on the four functions of management		

with special reference to leadership.

BMGT 510	Advanced Project Management	3(3,0)
This course is intended to equip graduate students with the ability to manage mega projects in addition to advanced knowledge of the latest techniques used in various areas of project management including project selection and planning, cost estimation and pricing, contracts and procurement, scheduling and resource management. PMI standards will serve as a point of reference in instruction. Real project casework will be provided and used for teaching and demonstration.		

BMGT 520	Corporate Governance	3(3,0)
This course deals with the optimization of economic results as viewed by the processes of corporate governance. Corporate governance is the way in which a corporation is directed, administered, and controlled. The balance of power between the corporation and its environment (the stake holders) is well studied in this course.		

BMGT 525	Entrepreneurship and Investment Capital	3(3,0)
Great business ideas will remain ideas unless the proper resources are allocated to transform it into business reality. This course discusses how business opportunities are created by matching entrepreneurs with capital. Students will look at how venture capitalists evaluate, value, and structure new entrepreneurial investments. Another aspect of this course is how venture capitalists manage their funds.		

BMGT 535	Ethics and Social Responsibility	3(3,0)
The purpose of this course is to enable students to make ethical decisions in business by providing them with a framework that they can use to identify, analyze, and resolve ethical issues in business decision making. In addition, social responsibility is an important part of a firm's business strategy. Issues such as the balance between business benefits and social benefits, the role of sustainability in business strategy; and the importance of stakeholder relationships will be discussed.		

BMGT 540	Organizational Leadership and Behavior	3(3,0)
This course provides a comprehensive analysis of individual and group behavior in organizations with emphasis on leadership. Its purpose is to provide an understanding of how organizations can be managed more effectively while enhancing the quality of employees work life. Topics include motivation, rewarding behavior, stress, individual and group behavior, conflict, power and politics,, decision-making, communication and organizational change and development		

BMGT 545	Operations and Supply Chain Management	3(3,0)
This course teaches students how to manage the operations related to the creation and distribution of goods and services, increasingly taking place outside the boundaries of		

traditional enterprise setting. This study includes analyzing processes, ensuring quality, creating value, and managing the flow of information, products and services across a network of customers, enterprises and supply chain partners.

BMKT 515	Branding and Franchising	
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Students will learn to develop a brand strategy, how to analyze and evaluate brands and manage them for maximum effectiveness. The course also examines brand planning, brand equity, brand architecture, and the different brand strategies. Franchise management issues and how to maintain and strengthen brand identity through franchising will also be analyzed.
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Elective Courses - Oil and Gas Management Program (12 Credits)

Students enrolled in the oil and gas management program are required to take the four specialization courses listed below along with their descriptions, in addition to the mandatory core business knowledge courses.

BADM 530	Oil and Gas Law, Contracts and Negotiations	3(3,0)
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This course presents coverage of the legal rules that govern the development of privately owned mineral rights, which often also apply to government-owned resources. It covers aspects such as the nature, protection, and conveyance of oil and gas rights, leasing, and taxation. In addition the course covers the structure and different types of oil and gas contracts.
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BECN 525	Energy Policy and Economics	3(3,0)
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This course covers the economics of various energy resources with emphasis on oil and gas. Students will be exposed to how market mechanisms shape and influence the demand for and the supply of energy. Moreover, the course examines energy cost structures and analyzes the relationship between energy consumption and the performance of the macro economy and economic growth.

BMGT 510	Advanced Project Management	3(3,0)
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This course is intended to equip graduate students with the ability to manage mega projects in addition to advanced knowledge of the latest techniques used in various areas of project management including project selection and planning, cost estimation and pricing, contracts and procurement, scheduling and resource management. PMI standards will serve as a point of reference in instruction. Real project casework will be provided and used for teaching and demonstration
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BMGT 530	Overview of the Global Oil and Gas Industry	3(3,0)
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This course presents a descriptive and analytical overview of the business of oil and gas. It addresses a wide range of topics organized around the oil and gas industry value chain, starting with exploration and ending with products sold to consumers. Topics include issues related to upstream, midstream and downstream aspects such as exploration, development, production,

transportation, trading, refining and marketing.
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MBA Capstone Research Project

Students in the MBA program with emphasis in General Business Administration are expected to complete their MBA studies by successfully completing a capstone research project, as described below.

BADM 590	MBA Research Project	3(3,0)
The MBA Research Project is a self-directed study undertaken by the student, under close supervision of a faculty member. The project is a capstone experience in the sense that it integrates together knowledge from various business areas, as part of complete research process designed to address a business issue agreed upon between the student and the faculty supervisor.		

By contrast, students in the MBA program with emphasis in Oil and Gas Management are expected to complete their MBA studies by successfully completing an oil and gas capstone research project, as described below.

BADM 595	Oil and Gas Research Project	3(3,0)
The Oil and Gas Research Project is a self-directed study undertaken by the student, under close supervision of a faculty member. The project is an oil and gas capstone experience in the sense that it integrates together knowledge from various areas, as part of complete research process designed to address an oil and gas issue of interest agreed upon between the student and the faculty supervisor.		

MBA Oil and Gas Practicum

Students enrolled in the Oil and Gas Management program are required to successfully complete a practical training practicum as described below.

BADM 585	Oil and Gas Practicum	0(0,3)
The Oil and Gas Practicum is a period of 1-2 month practical training performed at petroleum industry companies, for the purpose of enabling the student to gain firsthand experience in the business of oil and gas and develop a practical appreciation of the industry in general.		

FACULTY LIST

Abdallah, Samer; Adjunct Professor, Ph.D. in Robotics and MBA in Business Strategy, University of Sydney, Sydney, Australia, 1997.

Akoun, Ibrahim; Associate Professor and Chair, Ph.D. in Public Policy and Political Economy, University of Texas at Dallas, Dallas, USA, 1990.

Akoun, Rana; Instructor, MA in Business Law, Lebanese University, Lebanon, 2005.

Akoun, Rola; Instructor, MA in Business Law, Lebanese University, Lebanon, 2010.

Ayass, Arfan; Instructor, MS in Accounting, University of South Carolina, USA, 1969.

Bizri, Rima; Assistant Professor and Chair, Ph.D in Risk Management in Islamic Finance, Imam Ouzai University, Beirut, Lebanon, 2014.

Balaa, Yusra; Instructor, MBA in General Business, American University of Beirut, Lebanon, 1992.

Chaya, Jamil; Lecturer, Ph.D. in Money and Finance, University of Rome Tor Vergata, Rome, Italy, 2015.

Hajjar, Faysal; Instructor, MS in Finance; Saint Joseph University, Lebanon, 2005.

Hakim, Rima; Lecturer, M.S., CMA in Business Management, Beirut University College (BUC), Beirut, Lebanon, 1993.

Hammoud, Jamil; Associate Professor and Dean, Ph.D. in Economics, Ecole des Hautes Etudes en Sciences Sociales (EHESS), Paris, France, 2003.

Mansour, Samat Khayat; Instructor, MA in Economics, American University of Beirut, Lebanon, 2001.

Mozahem, Najib; Lecturer, Ph.D. in Organizational Theory, Durham Business School, Durham, England, 2015.

Rahal, Bassim; Instructor, MBA in Finance, Lebanese American University, Lebanon, 1999.

Saheb, Adel; Instructor, MS in Construction Management, University of Pittsburg, USA, 1987

Wahbi, Marwan; Lecturer, MBA in Marketing, Lebanese American University, Beirut, Lebanon, 2005.

Zoughaib, Mona; Lecturer; Ph.D in Management Science, University of Paris V, Descartes, France, 2009.

COLLEGE OF ENGINEERING

Officers of the College

Riad Chedid	President
Ahmad Smaili	Vice President for Academic Affairs
Hisham Basha	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, Mechatronics Engineering. Fully accredited by the Lebanese Ministry of higher education, the college is working with each department towards accreditation by the Engineering Accreditation Commission of ABET – the most prestigious accrediting agency worldwide.

The College also features active research programs in a number of engineering areas. In this regard, Master Degree's 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 the undergraduate and graduate programs.

Overview

The College of Engineering at RHU was established in order 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 21-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 class rooms, 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.

Academic Programs

The College of Engineering offers six programs leading to a Master of Science Degree (MS).

1. Master of Science in Civil Engineering
2. Master of Science in Electrical Engineering
3. Master of Science in Computer and communication 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 Communication Engineering

ELEC	Electrical and Electronics Engineering
MECH	Mechanical Engineering
MECA	Mechatronics Engineering

Admission Requirements

All applicants to the MS program must first satisfy the university graduate admission requirements specified in in this catalog.

Regular Admission

Applicants who satisfy the university graduate admission requirements for regular admission will be granted regular admission status into one of the six graduate programs, and will be exempted from any background and/or remedial courses.

Admission on Probation

Applicants admitted on probation may be required to take background and/or remedial courses, in addition to the graduate program requirements, in order to treat any deficiencies in their background. The number and nature of background and/or remedial courses are determined by the College's graduate admission committee on a case-by-case basis, depending on the strength of the applicant's file, professional work experience and undergraduate transcript.

Admission of Students with non-engineering Undergraduate Degrees

Applicants with undergraduate degrees in areas other than Engineering may have to take bridging courses, in addition to the graduate program requirements, to ensure that they have the necessary Engineering foundational knowledge for successful completion of the graduate program they want to join. The number and nature of background and/or remedial courses are determined by the College's graduate admission committee on a case-by-case basis, depending on the strength of the applicant's file, professional work experience, and undergraduate transcript.

Degree Requirements

To earn a MS degree in engineering students must complete a set number of credits, depending on the undergraduate earned degree as summarized in the following table.

Minimum MS degree Requirements			
Undergraduate studies		MS Degree Credits Requirements	
Degree	Credits Earned	Thesis Option	Non-Thesis Option
Bachelor of Science Degree	114 Credits	48 Credits	51 Credits

Bachelor of Engineering Degree	147 Credits	15 Credits	18 Credits
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These requirements are applicable to RHU graduates with a BS or a BE degree in Engineering and to non-RHU graduates whose undergraduate degrees cover at least the same number of RHU transferable credit hours. Others may be required to take additional graduate courses.

Note: Holders of a BS degree must first complete the requirements of the Last Year of the BE Program as described in the undergraduate catalog.

Graduate Studies Options

Graduate students may pursue one of two options, Thesis option or non-thesis option. The requirements for each option beyond the completion of all BE degree requirements are as follows:

Thesis Track

- Research Methods Course (3 credits)
- 600 level Technical Elective courses (6 credits)
- Thesis work (6 credits)

Non-Thesis Track

- Research Methods Course (3 credits)
- 600 level Technical Elective courses (12 credits)
- Project-based work (3 credits)

Master Project

In partial fulfillment of the requirements for the MS degree (non-thesis option) a student is required to complete a three credits project selected by the students and advisor and approved by the Dean in consultation with the College Council.

Master Thesis

In partial fulfillment of the requirements for the MS degree, a student must submit a thesis based on original, independent research. The thesis must be in English. Thesis timeline and regulations are briefly discussed below. The thesis consists of 6 credits encompassing two parts, Thesis I (3 credits) and Thesis II (3 credits). Student must work closely with his/her thesis advisor so that the thesis is completed during the semester the student register for Thesis II. In case more time is needed to complete the thesis work, the student may be allowed to register for Thesis II one additional time at no cost. Any registration beyond a second time the student shall be required to pay for the credits.

Timeline

The following tables summarize thesis regulations and completion deadlines.

Table 1 Steps towards Thesis completion

	Date	Form to complete
Orientation	First week of the first semester	
Plan of study	End of first semester	(GS-1)
Thesis committee formation	End of 1st semester	
Thesis proposal	See table 2	(GS-2)
Thesis defense	See table 2	(GS-3)
Thesis copy to Library	See table 2	

Table 2 Deadlines for completing thesis

Deadline for	to graduate in		
	August	December	May
Approval of thesis proposal and committee	Apr 30	Sept 15	Jan 15
Thesis defense	July 15	Dec 15	Apr 30
Deposit of thesis at library	July 25	Dec 24	May 10

Committee

Normally, the thesis advisor is chosen from among the full-time professorial faculty of the department. The thesis advisor and the graduate student must form the thesis committee. The committee shall be composed of: the thesis advisor as chairperson, and at least two other members from RHU academic community. At least two members of the thesis committee must be members of the department to which the student belongs. Committees can include up to four members. The additional member could be from RHU, industry, or from an institution other than RHU. All academic committee members should hold professorial rank. The thesis committee approves the thesis topic and research program and conducts the thesis defense examination. **The thesis committee shall be approved by the Dean in consultation with the CGSC.**

Proposal

Once the plan of study is approved, the student must submit to the CGSC a proposal approved by the thesis committee and the chairperson of the department at least two weeks before the CGSC meets. The proposal must include: Thesis objectives, Scope of work with relevant literature review, Research methodology, Expected findings, and Expected date of graduation.

The Proposal Cover Page Form (GS-2) must be submitted with the proposal. The CGSC will render a decision on the proposal on the following dates: April 30 for students graduating in August September 15 for students graduating in December January 15 for students graduating in May.

The decision of the CGSC is communicated to the student through his/her thesis advisor.

It is the student's responsibility to keep members of the thesis committee informed of the progress of his/her work and to seek their feedback.

Format

The required thesis format is explained in the Thesis Manual which is available at the Library. The thesis manual provides instructions on the preparation of thesis. Theses not conforming to the requirements of the thesis manual will not be accepted. An abstract not exceeding 350 words must be submitted.

For all matters not discussed in the manual, theses must follow the form and style described in the latest edition of K. L. Turabian, *Manual for Writers of Term Papers, Thesis and Dissertations* (University of Chicago Press), or any other form specified by the department or program provided this conforms to the manual.

Defense

A graduate student may not have his/her thesis defense until he/she has successfully completed at least 30 credits of the course requirements for the master's degree and secured the permission of the thesis advisor.

A final draft of the thesis must be prepared in consultation with each member of the thesis committee. The final draft of the thesis must be submitted to each member of the thesis committee at least two weeks before the date of the thesis defense.

The thesis defense should take place at least four months after the approval of the proposal by the GC. The deadlines for the thesis defense for students who wish to graduate in August, December, or May are July 15, December 15, and April 30, respectively.

The thesis defense will be open to the public and will be announced at least one week in advance. The total time allocated for the thesis defense should allow for answering all questions and should normally not exceed 90 minutes.

The results of the thesis defense shall be reported on a special form, Form GS-3, signed by the chairperson and members of the thesis committee. This form is communicated by the chairperson of the department to the Registrar with a copy of the plan of study form (GS-1) indicating the graduate courses completed by the student, and the attained grades. In the event that the student fails the thesis defense, the student may resubmit the thesis and defend it after a period of at least three months. Failure on the second attempt results in automatic dismissal from the thesis work.

After successful defense of the thesis, the chairperson of the department recommends to the GC that the student be granted the master's degree. A student must be registered for Thesis-II in the semester in which he/she is expected to graduate.

Thesis Grade

The Thesis grade is P for Pass and F for Fail. If the Thesis committee deems that the thesis work is exceptional they may recommend the department granting the student a commendation that would reflect the exceptional outcome of his/her work.

Submission of the Thesis to the Library

The student, after passing the thesis defense, must submit two hard and one soft copy of the thesis, complete with abstract and signatures of the members of the thesis committee, to the Library. The receipt of these copies is submitted by the student to the office of the Registrar before the student is awarded the degree.

Study Plans

In the following sections the study plan for each MS program offered in the College of Engineering is presented followed by the descriptions of the associated 600 level courses.

Civil Engineering Program

The following study plan summarizes the courses and credit distribution for the Masters of Science (MS) in Civil Engineering. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits
ENGR 600	Engineering Research Methods	3
CIVE 690	Capstone Research Project (non-thesis option)	3
CIVE 695A	Thesis I (thesis option)	3
CIVE 695B	Thesis II (thesis option)	3
CIVE 6xx	Technical Elective I	3
CIVE 6xx	Technical Elective II	3
CIVE 6xx	Technical Elective III (non-thesis option)	3
CIVE 6xx	Technical Elective IV (non-thesis option)	3

A. Engineering Research Methods

The research methodology course is mandated by the MEHE. This course must be taken by all MS bound students. However the specific experiences organized around the general topics may be tailored to meet program's need. The description of the Engineering required course is described below.

ENGR 600	Engineering Research Methods	3(3,0)
This course introduces students to quantitative and qualitative methods for engaging in meaningful research. The student, at the end of the course, will attain skills in research intent and design, methodology and technique, format and presentation, and data management. Throughout the course, the student's ability to use this knowledge to become a more effective researcher will be developed. In particular, the student will be able to develop a hypothesis about a research problem and develop related questions; frame the problem with the correct research methodology; collect data that accurately addresses the research problem; measure the effectiveness of a solution methodology; analyze data to make informed decisions; provide technical documentation of all the phases of a research project; evaluate feasibility of research proposals; and present data to support decisions in front of stakeholders.		

B. Research Project/Thesis

CIVE 690	Capstone Research Project	3(3, 0)
A capstone course requiring group work in one of the emphasis areas offered by the Department. The project is to be carried out under the supervision of a full-time faculty member and culminated in a formal written and oral report (refer to college guidelines related		

to graduation projects structure and content). **Prerequisite:** Accepted petition to graduate.

CIVE 695A	Master Thesis I	3(3, 0)
Includes guided review of research literature and/or pilot work relevant to the thesis topic. By the end of this course the candidate for the MS degree should have established a hypothesis, a research methodology and a work schedule for the completion of his/her thesis. A brief, written report is expected at the end of the course and should be approved by the research advisor(s). (This course may be repeated only once to accomplish its objective). Prerequisite: Accepted petition to graduate.		

CIVE 695B	Master Thesis II	3(3, 0)
Continuation of CIVE 695A, Includes the completion and submission of a research thesis, the quality of which is judged acceptable by the jury committee established in accordance with the College of Engineering and Graduate Committee guidelines. (This course may be repeated only once to accomplish its objective). Prerequisite: CIVE 695A.		

C. Elective Courses

As part of the program for the Masters of Science in Civil Engineering, the student is required to take a total of 6 credit hours (9 credit hours for non-thesis option) of 600 level technical elective courses. These courses allow the student to attain an in-depth knowledge and understanding in a focus area of interest. The student who chooses the non-thesis option can mix and match elective courses from the different areas to acquire broader knowledge of different Civil Engineering disciplines. The thesis option student should select, in coordination with the thesis advisor, the set of electives that best meet the requirements for successful completion of his/her thesis. The CIVE available technical elective courses are distributed in three areas:

1. Structures, Materials and Geotechnical Engineering
2. Water & Environmental Engineering
3. Public Works, Construction Management

It is highly recommended that students take 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 the approval of the thesis committee. The list of recommended technical electives is given below.

Course #	Title	Credits	Prerequisites
Structures, Materials and Geotechnical			
CIVE 612	Advanced Structural Analysis	3	CIVE 507
CIVE 613	Advanced Reinforced Concrete	3	CIVE 415
CIVE 614	Retaining Structures	3	CIVE 424
CIVE 615	Soil and Site Improvement	3	CIVE 424

CIVE 616	Advanced Construction Systems	3	CIVE 415, CIVE 417
Water & Environmental Engineering			
CIVE 672	Environmental Impact Assessment	3	CIVE 332
CIVE 673	Irrigation and Drainage Engineering	3	CIVE 435
CIVE 674	Environmental Policy and Management	3	CIVE 332
CIVE 675	Hydraulic and Hydrologic Modeling	3	CIVE 536
CIVE 676	Hydraulic Structures	3	CIVE 435, CIVE 424
Public Works & Construction Management			
CIVE 604	Infrastructure Asset Management	3	Senior Standing
CIVE 605	Decision Making and Risk Management	3	MATH 351
CIVE 642	Bridge Engineering	3	CIVE 415, CIVE 424
CIVE 643	Advanced Highway Engineering	3	CIVE 342, CIVE 415
CIVE 644	Airport Engineering	3	CIVE 342

Course Descriptions

Structures, Materials and Geotechnical

CIVE 612	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 613	Advanced Reinforced Concrete	3(3, 0)
Design of reinforced concrete walls: walls designed as compression members; empirical design method; alternative design of slender walls; shear walls; and pre-cast concrete. Distribution of forces among members, member design, structural integrity, connection and bearing design, strength evaluation of existing structures, reinforced concrete arches. Prerequisite: CIVE 415.		

CIVE 614	Retaining Structures	3(3, 0)
Lateral earth pressures: at rest, active and passive states, limit equilibrium methods and theory of elasticity, seismic conditions, hydrostatic and seepage pressures. Retaining walls: design of gravity, cantilever, and basement walls. Sheet-piles: cantilever and anchored bulkheads, free- and fixed-earth support methods, moment reduction, and anchorage design. Braced cuts: pressure envelopes, design of sheeting, wale beams and struts, stability against bottom heave or piping. Shoring systems: types, control of groundwater, construction stages, anchors prestressing and testing, ground settlement around excavations. Code requirements, computer applications. Prerequisite: CIVE 424.		

CIVE 615	Soil and Site Improvement	3(3, 0)
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Mechanical methods: compaction theory, properties of compacted soils, laboratory tests, field equipment, compaction specifications and control, dynamic compaction, vibroflotation, blasting techniques. Hydraulic methods: theory of wells, dewatering systems, drainage of slopes, preloading and use of vertical sand/wick drains. Physical and chemical methods: granular admixtures, Portland cement, lime, calcium chloride, fly ash, bitumen, grouting materials and techniques. Inclusion methods: reinforced earth with steel strips or geosynthetics, soil nails and rock bolts. Laboratory and computer applications. **Prerequisite:** CIVE 424.

CIVE 616	Advanced Construction Systems	3(3,0)
Composite systems; composite beams and columns; Lateral resisting systems; Braced Frames, Moment Resisting Frames (OMRF-SMRF), Shear Wall, Dual System, Core System. Design and detailing of special joints. Prerequisite: CIVE 415, CIVE 417. On demand.		

Water & Waste Water Treatment

CIVE 672	Environmental Impact Assessment	3(3,0)
Study and evaluation of the impacts of large scale projects on the physical, biological, and socio-economic environmental aspects taking into account environmental laws and regulations and EIA guidelines, identification of impacts, quantification methods, mitigation measures, and monitoring plans. Case study involving the preparation of an EIA report including sustainability impact assessment and preparation of an environmental management plan. Prerequisite: CIVE 332. On demand.		

CIVE 673	Irrigation and Drainage Engineering	3(3, 0)
Irrigation: planning and design of canals networks, field irrigations, sprinkler irrigation system, drip irrigation system, drainage: importance of drainage, open drainage design and planning, tile drainage design and planning, canal lining design. Prerequisite: CIVE 435.		

CIVE 674	Environmental Policy and Management	3(3,0)
This course explores human made problems in the environment parallel with concepts in environmental ethics, management and policies so as solutions are provided concerning preservation of the environment. Topics covered are pollution of air, water, and soil, international and national environmental ethics, management and policies. Prerequisite: CIVE 332. On demand.		

CIVE 675	Hydraulic and Hydrologic Modeling	3(3, 0)
Hydraulic modeling: Physical modeling, numerical modeling, hydrologic modeling, application of deterministic and probabilistic concept to simulate and analyze hydrologic systems; discussion of the theory and application of linear and non-linear, lumped, and distributed systems techniques in modeling the various phases of the hydrologic cycle.		

Prerequisite: CIVE 536.

CIVE 676	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 424, CIVE 435. On demand.		

Public Works

CIVE 604	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 605	Decision Making and Risk Management	3(3,0)
Decision making, risk analysis, quantitative analysis, and application of quantitative methods to construction projects' environment. Prerequisite: Senior Standing.		

CIVE 642	Bridge Engineering	3(3,0)
Types of bridges and influence lines. Loads and their distribution on bridges, serviceability of bridges, design of bridge deck, superstructure, and substructure. Prerequisite: CIVE 415; CIVE 424. On demand.		

CIVE 643	Advanced Highway Engineering	3(3, 0)
Highway and Airport pavement design (flexible and rigid pavements), Stress Analysis in flexible and rigid pavements, pavement response under traffic load, failure of flexible and rigid pavements, highway pavement maintenance and rehabilitation (methods, programs, management), types and design, Hot mix Asphalt Concrete: Materials, Design Methods and Testing. Prerequisite: CVLE 342, CIVE 415.		

CIVE 644	Airports Engineering	3(3, 0)
Principles of Airport Planning, Components of Airports (airside, landside), Aircraft characteristics, Airport operations, Airport System planning, Site selection, Land use, Airport terminal area and airport access, Airport Capacity and delays, Airport geometric design (Runways, Taxiways, Aprons), Safety Surfaces (Obstacle limitation surfaces: approach, take-off, transition, conical, horizontal), Airport pavement (types, design, construction). Prerequisite: CIVE 342.		

CIVE 645	Urban Transportation Planning	3(3, 0)
A detailed review of the transportation planning process; inventory methodologies; trip		

generation, distribution and assignment with associated mathematical models and theories; prediction of future travel; land and use models; modal split; developing and testing of proposed systems; simulation. **Prerequisite:** CIVE 342

CIVE 691	Topics in Civil Engineering	3(3, 0)
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A detailed investigation of a topic of current significance in civil engineering such as: design of small earth dams, man and the environment, drilling and blasting, scheduling construction operations, operations research and optimization, construction equipment and methods, traffic safety, optimum structural design, environmental impact analysis, systems analysis in civil engineering, and current issues and advances in civil engineering. May be repeated to a maximum of 6 credits, but only 3 credits can be earned under the same title.

Prerequisite: Graduate studies.

Electrical Engineering Program

The following study plan summarizes the courses and credit distribution for the Masters of Science (MS) in Electrical Engineering. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits
ENGR 600	Engineering Research Methods	3
ELEC 690	Capstone Research Project (non-thesis option)	3
ELEC 695A	Thesis I (thesis option)	3
ELEC 695B	Thesis II (thesis option)	3
ELEC 6xx	Technical Elective I	3
ELEC 6xx	Technical Elective II	3
ELEC 6xx	Technical Elective III (non-thesis option)	3
ELEC 6xx	Technical Elective IV (non-thesis option)	3

A. Engineering Research Methods

The research methodology course is mandated by the MEHE. This course must be taken by all MS bound students. However the specific experiences organized around the general topics may be tailored to meet program's need. The description of the Engineering required course is described below.

ENGR 600	Engineering Research Methods	3(3,0)
This course introduces students to quantitative and qualitative methods for engaging in meaningful research. The student, at the end of the course, will attain skills in research intent and design, methodology and technique, format and presentation, and data management. Throughout the course, the student's ability to use this knowledge to become a more effective researcher will be developed. In particular, the student will be able to develop a hypothesis about a research problem and develop related questions; frame the problem with the correct research methodology; collect data that accurately addresses the research problem; measure the effectiveness of a solution methodology; analyze data to make informed decisions; provide technical documentation of all the phases of a research project; evaluate feasibility of research proposals; and present data to support decisions in front of stakeholders.		

B. Research Project and Thesis

ELEC 690	Capstone Research Project	3(3, 0)
A capstone course requiring group work in one of the emphasis areas offered by the Department. The project is to be carried out under the supervision of a full-time faculty member and culminated in a formal written and oral report (refer to college guidelines		

related to graduation projects structure and content). **Prerequisite:** Accepted petition to graduate.

ELEC 695A	Master Thesis I	3(3, 0)
Includes guided review of research literature and/or pilot work relevant to the thesis topic. By the end of this course the candidate for the MS degree should have established a hypothesis, a research methodology and a work schedule for the completion of his/her thesis. A brief, written report is expected at the end of the course and should be approved by the research advisor(s). (This course may be repeated only once to accomplish its objective). Prerequisite: Accepted petition to graduate.		

ELEC 695B	Master Thesis II	3(3, 0)
Continuation of ELEC 695A - Includes the completion and submission of a research thesis, the quality of which is judged acceptable by the jury committee established in accordance with the College of Engineering and Graduate Committee guidelines. (This course may be repeated only once to accomplish its objective). Prerequisite: ELEC 695A.		

C. Elective Courses

As part of the program for the Masters of Science in Electrical Engineering, the student is required to take a total of 6 credit hours (9 credit hours for non-thesis option) of 600 level technical elective courses. These courses allow the student to attain an in-depth knowledge and understanding in a focus area of interest. The student who chooses the non-thesis option can mix and match elective courses from the different areas to acquire broader knowledge of different Electrical Engineering disciplines. The thesis option student should select, in coordination with the thesis advisor, the set of electives that best meet the requirements for successful completion of his/her thesis. The ELEC available technical elective courses are distributed in three areas:

1. Power
2. Renewable Energy
3. Intelligent Systems

It is highly recommended that students take 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 the approval of the thesis committee. The list of recommended technical electives is given below.

Course #	Title	Credits
Power		
ELEC 611	Computer Modeling of Electrical Power Systems	3
ELEC 612	Electric Power System Control	3
Renewable Energy		

ELEC 621	Renewable Energy Resources and Technologies	3
ELEC 622	The Smart Grid	3
Intelligent Systems		
ELEC 631	Digital Control	3
ELEC 632	Nonlinear Adaptive Control	3

Course Descriptions

Power

ELEC 611	Computer Modeling of Electrical Power Systems	3(3,0)
This course is intended to teach electrical engineering students how to simulate the changing states of electrical power systems by studying the performance and predicting the disturbances of the power system boosted by the FACTS. It describes the mathematical background, algorithms and the basic tools needed to simulate interconnected complex power systems and likely response to different types of network pathologies or disturbances.		

ELEC 612	Electric Power System Control	3(3,0)
This is a course on the structure of modern power systems, the different levels of control, and the nature of stability problems. The course will introduce students to the generators, excitation systems, prime movers, ac and dc transmission, and system loads as well as the principles of active and reactive power control, and models for control equipment.		

Renewable Energy

ELEC 621	Renewable Energy Resources and Technologies	3(3,0)
This course covers renewable energy technologies from the engineering point of view: applications, engineering calculations and design, feasibility and so on. The main aim of the course is to provide the student with a systematic understanding of current knowledge, problems and insight into the field of renewable energy technologies.		

ELEC 622	The Smart Grid	3(3,0)
The use of communications and information technologies is likely to cause major shifts in the way energy gets delivered. The smart grid will use these technologies to deliver electricity reliably and efficiently, and it has the potential to radically change the electricity sector in the same way that new technologies changed the telecommunications sector. This course will examine not just the smart grid technologies, but 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.		

Intelligent Systems

ELEC 631	Digital Control	3(3,0)
<p>This course is a comprehensive introduction to digital control system analysis and synthesis. The course covers analysis and synthesis of sampled-data control systems. It capitalizes on the knowledge of the student in Classical Control to extend classical methods for analysis and synthesis of digital control systems. The course also introduces digital control methods which are not based on classical control theory.</p>		

ELEC 632	Nonlinear Adaptive Control	3(3,0)
<p>This course presents a comprehensive exposition of the theory of nonlinear dynamical systems and its control. It will focus on (1) methods of characterizing and understanding the behavior of systems that can be described by nonlinear ordinary differential equations, and (2) methods for designing controllers for such systems. In the design parts we will focus on the nonlinear robust adaptive control. Both classical and modern concepts from nonlinear system theory will be introduced.</p>		

Computer and Communications Engineering Program

The following study plan summarizes the courses and credit distribution for the Masters of Science (MS) in Computer and Communications Engineering. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits
ENGR 600	Engineering Research Methods	3
CCEE 690	Capstone Research Project (non-thesis option)	3
CCEE 695A	Thesis I (thesis option)	3
CCEE 695B	Thesis II (thesis option)	3
CCEE 6xx	Technical Elective I	3
CCEE 6xx	Technical Elective II	3
CCEE 6xx	Technical Elective III (non-thesis option)	3
CCEE 6xx	Technical Elective IV (non-thesis option)	3

A. Engineering Research Methods

The research methodology course is mandated by the MEHE. This course must be taken by all MS bound students. However the specific experiences organized around the general topics may be tailored to meet program's need. The description of the Engineering required course is described below.

ENGR 600	Engineering Research Methods	3(3,0)
This course introduces students to quantitative and qualitative methods for engaging in meaningful research. The student, at the end of the course, will attain skills in research intent and design, methodology and technique, format and presentation, and data management. Throughout the course, the student's ability to use this knowledge to become a more effective researcher will be developed. In particular, the student will be able to develop a hypothesis about a research problem and develop related questions; frame the problem with the correct research methodology; collect data that accurately addresses the research problem; measure the effectiveness of a solution methodology; analyze data to make informed decisions; provide technical documentation of all the phases of a research project; evaluate feasibility of research proposals; and present data to support decisions in front of stakeholders.		

B. Research Project/Thesis

CCEE 690	Capstone Research Project	3(3, 0)
A capstone course requiring group work in one of the emphasis areas offered by the Department. The project is to be carried out under the supervision of a full-time faculty member and culminated in a formal written and oral report (refer to college guidelines related to graduation projects structure and content). Prerequisite: Accepted petition to		

graduate.

CCEE 695A	Master Thesis I	3(3, 0)
Includes guided review of research literature and/or pilot work relevant to the thesis topic. By the end of this course the candidate for the MS degree should have established a hypothesis, a research methodology and a work schedule for the completion of his/her thesis. A brief, written report is expected at the end of the course and should be approved by the research advisor(s). (This course may be repeated only once to accomplish its objective). Prerequisite: Accepted petition to graduate.		

CCEE 695B	Master Thesis II	3(3, 0)
Continuation of CCEE 695A, Includes the completion and submission of a research thesis, the quality of which is judged acceptable by the jury committee established in accordance with the College of Engineering and Graduate Committee guidelines. (This course may be repeated only once to accomplish its objective). Prerequisite: CCEE 695A.		

C. Elective Courses

As part of the program for the Masters of Science in Computer and Communications Engineering, the student is required to take a total of 6 credit hours (9 credit hours for non-thesis option) of 600 level technical elective courses. These courses allow the student to attain an in-depth knowledge and understanding in a focus area of interest. The student who chooses the non-thesis option can mix and match elective courses from the different areas to acquire broader knowledge of different Computer and Communications Engineering disciplines. The thesis option student should select, in coordination with the thesis advisor, the set of electives that best meet the requirements for successful completion of his/her thesis. The CCEE available technical elective courses are distributed in four areas:

1. Computer Software and Artificial Intelligence
2. Computer Hardware
3. Networking
4. Signal Processing and Wireless Communications

It is highly recommended that students take 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 the approval of the thesis committee. The list of recommended technical electives is given below.

Course #	Title	Credits	Prerequisites
Computer Software and Artificial Intelligence			
CCEE 611	Game Design and Programming	3	

CCEE 612	Advanced Data Mining	3	CCEE 515
Computer Hardware			
CCEE 621	Reconfigurable Computing	3	CCEE 426
CCEE 623	Advanced Embedded Systems	3	CCEE 426
Networking			
CCEE 631	Multimedia Systems	3	CCEE 447
CCEE 632	Ad-hoc Networks	3	CCEE 448
Signal Processing and Wireless Communications			
CCEE 641	Security in Wireless Networks	3	CCEE 537
CCEE 642	Satellite Communication Systems	3	CCEE 441

Course Descriptions

Computer Software and Artificial Intelligence

CCEE 611	Game Design and Programming	3(3,0)
This course teaches the student basics of object-oriented architectures and software design patterns used in game design. The student will learn how to design and implement several kinds of games, animation techniques, physics simulation, user controls, graphical methods, and intelligent behaviors.		

CCEE 612	Advanced Data Mining	3(3,0)
In this course advanced data mining topics will be covered, namely: classification (decision trees, logistic regression, support vector machines), combining multiple learners (bagging, boosting, cascading, stacking), clustering (k-means, EM, hierarchical clustering, topic modeling), dimensionality reduction (principal component analysis, linear discriminant analysis, subset selection), and graphical models (Bayesian networks, Markov networks). More advanced topics will be covered through student presentations such as: active learning, multi-label learning, graph mining, link prediction, data mining in bioinformatics, social media analytics, privacy-aware data mining, viral marketing, recommender systems, large scale data mining, temporal pattern mining, stream data mining, and outlier detection.		

Computer Hardware

CCEE 621	Reconfigurable Computing	3(3,0)
This course introduces the student to the state-of-the-art in reconfigurable computing (RC) from a hardware as well as software perspectives. Numeric and signal processing applications will be used to illustrate RC platforms advantages. Field-programmable gate arrays (FPGAs) will be reviewed first focusing on their hardware limitations and their effect on the placement and routing problems. Then the architecture for existing multi-FPGA systems and the compilation techniques for mapping applications described in a hardware description language to RC are		

introduced. Finally, specific contemporary RC systems are examined. Students will be expected to work with recent existing RC hardware to design and implement working projects.
Prerequisite: CCEE 323.

CCEE 623	Advanced Embedded Systems	3(3,0)
<p>This course introduces the student to Real-time operating systems (RTOS). The RTOS topics of managing multiple tasks and processes, context switching, task scheduling, and inter-process communication mechanisms are introduced. The student will also learn how to ensure system reliability and fault tolerance. Student will be expected to use state of the art development tools to design and implement useful projects. Prerequisite: CCEE 323.</p>		

Networking

CCEE 631	Multimedia Systems	3(3,0)
<p>Multimedia applications and requirements, Audio/Video fundamentals including analog and digital representations, human perception, and audio/video equipment, audio and video compression including perceptual transform coders for images/video scalable coders and perceptual audio encoders. Application and performance comparison of various coding algorithms including hardware/software trade-offs. Image and video processing applications and algorithms. Multimedia hardware and software. Prerequisite: CCEE 447.</p>		

CCEE 632	Ad-hoc Networks	3(3,0)
<p>This course will provide students with an understanding of wireless ad-hoc networks, enable them to recognize the wide range of applicability of these networks, and provide them with an understanding of the major design issues, including topics such as protocol mechanisms and resource constraints.</p>		

Signal Processing and Wireless Communications

CCEE 641	Security in Wireless Networks	3(3,0)
<p>This course will present the most important mechanisms dedicated to protect data integrity and confidentiality, access control, authentication, user privacy, quality and continuity of service, in wireless networks. Topics include: Wireless Technology Overview, Risks and Threats of Wireless, Security under Resource Constraints (bandwidth, memory, computation, energy constraints), Intrusion and Anomaly Detection in Wireless Environments, Key Management in Wireless Environments, Privacy and Anonymity in Wireless Environments, Public Key Infrastructure in Wireless Environments, Authentication, Authorization, and Access Control in Wireless Environments, Standards in Wireless Security (Equivalent Privacy Standard (WEP), Extensible Authentication Protocol (EAP), Wi-Fi Protected Access (WPA, WPA2, IEEE 802.11i), Bluetooth Security, RFID Security, Secure Mobile Commerce, Secure Wireless Multimedia Broadcast.</p>		

CCEE 642	Satellite Communication Systems	3(3,0)
Description of a Satellite Communication System, Orbit Types, Radio Regulations Applications of Communication Satellites. Multiple Access Techniques. Multi-beam Satellite Systems, Regenerative Satellite Systems, Broadcasting by Satellites, Satellite Communication Techniques, Satellite Communication Payload, Earth Station Technology. Prerequisite: CCEE 441.		

Biomedical Engineering Program

The following study plan summarizes the courses and credit distribution for the Masters of Science (MS) in Biomedical Engineering. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits
ENGR 600	Engineering Research Methods	3
BIOM 690	Capstone Research Project (non-thesis option)	3
BIOM 695A	Thesis I (thesis option)	3
BIOM 695B	Thesis II (thesis option)	3
BIOM 6xx	Technical Elective I	3
BIOM 6xx	Technical Elective II	3
BIOM 6xx	Technical Elective III (non-thesis option)	3
BIOM 6xx	Technical Elective IV (non-thesis option)	3

A. Engineering Research Methods

The research methodology course is mandated by the MEHE. This course must be taken by all MS bound students. However the specific experiences organized around the general topics may be tailored to meet program's need. The description of the Engineering required course is described below.

ENGR 600	Engineering Research Methods	3(3,0)
<p>This course introduces students to quantitative and qualitative methods for engaging in meaningful research. The student, at the end of the course, will attain skills in research intent and design, methodology and technique, format and presentation, and data management. Throughout the course, the student's ability to use this knowledge to become a more effective researcher will be developed. In particular, the student will be able to develop a hypothesis about a research problem and develop related questions; frame the problem with the correct research methodology; collect data that accurately addresses the research problem; measure the effectiveness of a solution methodology; analyze data to make informed decisions; provide technical documentation of all the phases of a research project; evaluate feasibility of research proposals; and present data to support decisions in front of stakeholders.</p>		

B. Research Project/Thesis

BIOM 690	Capstone Research Project	3(3, 0)
<p>A capstone course requiring group work in one of the emphasis areas offered by the Department. The project is to be carried out under the supervision of a full-time faculty member and culminated in a formal written and oral report (refer to college guidelines related to graduation projects structure and content). Prerequisite: Accepted petition to</p>		

graduate.

BIOM 695A	Master Thesis I	3(3, 0)
Includes guided review of research literature and/or pilot work relevant to the thesis topic. By the end of this course the candidate for the MS degree should have established a hypothesis, a research methodology and a work schedule for the completion of his/her thesis. A brief, written report is expected at the end of the course and should be approved by the research advisor(s). (This course may be repeated only once to accomplish its objective). Prerequisite: Accepted petition to graduate.		

BIOM 695B	Master Thesis II	3(3, 0)
Continuation of BIOM 695A, Includes the completion and submission of a research thesis, the quality of which is judged acceptable by the jury committee established in accordance with the College of Engineering and Graduate Committee guidelines. (This course may be repeated only once to accomplish its objective). Prerequisite: BIOM 695A.		

C. Elective Courses

As part of the program for the Masters of Science in Biomedical Engineering, the student is required to take a total of 6 credit hours (9 credit hours for non-thesis option) of 600 level technical elective courses. These courses allow the student to attain an in-depth knowledge and understanding in a focus area of interest. The student who chooses the non-thesis option can mix and match elective courses from the different areas to acquire broader knowledge of different Biomedical Engineering disciplines. The thesis option student should select, in coordination with the thesis advisor, the set of electives that best meet the requirements for successful completion of his/her thesis. The BIOM available technical elective courses are distributed in three areas:

1. Medical Instrumentation and Imaging
2. Clinical Engineering and Bio-informatics
3. Artificial organs

It is highly recommended that students take 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 the approval of the thesis committee. The list of recommended technical electives is given below.

Course #	Title	Credits	Prerequisites
Medical Instrumentation and Medical Imaging			
BIOM 611	Interventional Treatment Systems	3	BIOM 414
BIOM 612	Emerging Techniques in Healthcare	3	BIOM 417
BIOM 613	Human Performance Engineering	3	BIOM 530
BIOM 621	Cardiovascular Explorations and Angiographic	3	BIOM 522

	Procedures		
BIOM 622	MRI Research and Innovations	3	BIOM 522
BIOM 623	Functional and Molecular Imaging	3	BIOM 522; BIOM 530
Clinical Engineering and Bio-informatics			
BIOM 631	Risk Management	3	
BIOM 632	Health Care Facility Management	3	
BIOM 633	Medical Technology & Ethics	3	BIOM 531
BIOM 651	Medical Informatics and Artificial Intelligence	3	
BIOM 652	Bio-computation	3	
BIOM 653	Biometrics	3	
Artificial Organs			
BIOM 641	Prostheses	3	BIOM 519
BIOM 642	Transport Phenomena	3	BIOM 522
BIOM 643	Genetic and Tissue Engineering	3	BIOM 416

Course Descriptions

Medical Instrumentation and Medical Imaging

BIOM 611	Interventional Treatment Systems	3(3,0)
<p>This course introduces students to the contributions of technology to direct disease treatment. It highlights the need for reliable technology development for surgical suite healthcare interface. The emphasis will be on assessing the wide variety of technologies that have made surgical procedures more reliable, less traumatic, and shorter in duration, as well as understanding materials know-how advances that lead to the development of technologies allowing minimally invasive treatment of a variety of diseases. Covered topics include: anesthesia/monitoring devices, intraoperative neurophysiological monitoring, spontaneous activity, angioplasty, stents, embolic filters, cardiac ablation catheters, stereotactic procedures and clinical applications. Prerequisite: BIOM 414.</p>		

BIOM 612	Emerging Techniques in Healthcare	3(3,0)
<p>This course introduces students to new treatment and diagnosis strategies, as well as new applications of existing technologies, have emerged wide range of ideas as case studies in innovation. It highlights the factors determining the degree to which these techniques become accepted. The emphasis will be on proving the efficacy of the emerging medical technologies. Covered topics include: hyperbaric oxygen therapy, indications and outcomes for hyperbaric oxygen treatment, delivery strategies for image-guided thermal therapy, electrotherapy, hearing and audiologic assessment, pure-tone audiometry, speech recognition testing, spontaneous otoacoustic emissions (SOAE), immittance audiometry, slit lamp, ophthalmology sets, ear, nose and throat (ENT) devices. Prerequisite: BIOM 417.</p>		

BIOM 613	Human Performance Engineering	3(3,0)
<p>This course describes concepts, methods, and tools that strive toward treatment of each of specific areas with the engineering rigor that is routinely applied to artificial systems. It emphasizes on the evaluation of an individual's performance capacities; the design of assistive devices and the design of operator interfaces for medical instruments. Importance is thus placed on combination of cause-and-effect and statistical models, measurements of varying degrees of sophistication that are selected to fit needs of a particular circumstance, and various types of analyses. Covered topics include: gait analysis, neuromuscular functional unit, range of motion and extremes of motion, endurance, reliability, limitations, analysis of sensory-motor control performance, measurement instruments and procedures, models of human mental processing and performance, physical task analysis. Prerequisite: BIOM 530.</p>		
BIOM 621	Cardiovascular Explorations and Angiographic Procedures	3(3,0)
<p>This course describes interaction between biomechanics and medical imaging disciplines through discussion of various imaging modalities and techniques used for the diagnosis for heart and vessel complications. It emphasizes on the study of blood flow, investigation of vessels properties, assessment of arteries dimensions and obstructions as well as monitoring of injected catheters and/or stents. The interests and principles of non-invasive methods such as Ultrasound and NMR will be detailed also purposes of X-ray based interventional imaging systems will be presented. Covered topics include: Colored Doppler, Cardiac MRI, Cardiac Function, Atherosclerosis, Carotid Bifurcation, Brain Perfusion, Fluoroscopy, contrast agents. Prerequisite: BIOM 522.</p>		
BIOM 622	MRI Research and Innovations	3(3,0)
<p>This course introduces students to the latest improvement in diagnosis and health care follow-up using magnetic resonance imaging systems. The emphasis will be on presenting MR sequence engineering applications in diverse medical fields, as well as discussing MR based spectroscopy principles and objectives. The MR safety, complications, artifacts definition, limitations and associated proposed solutions will be detailed. Covered topics include: Fast Spin Echo, FLAIR, Time of flight, Diffusion Weighted Imaging, Parallel Imaging, Magneto hydrodynamics, Magnetic susceptibility, aliasing, saturation. Prerequisite: BIOM 522.</p>		
BIOM 623	Functional and Molecular Imaging	3(3,0)
<p>This course introduces student to in vivo characterization of biological processes at the cellular and molecular level, and visualization of in vivo physiologic or biochemical processes achieved with different imaging modalities, mostly MRI, PET and SPECT. The course will highlight increasing attention this type of imaging has received in recent years because imaging the distribution of targeted molecules allows the tracking of biochemical processes before their physiological consequences appear. Several applications in neurological studies and cardiovascular explorations are to be described. Covered topics include: Kinetic modeling, parametric imaging, glucose metabolism, radioactive tracer, regional cerebral blood flow,</p>		

regional cerebral oxygen extraction fraction (rCOEF), and the arterial oxygen concentration (CaO₂). **Prerequisite:** BIOM 522 and BIOM 530.

Clinical Engineering and Bio-informatics

BIOM 631	Risk Management	3(3,0)
This course describes deep roots inside health care of the organized effort to identify, assess, and reduce physical and financial risk to patients, staff, and business. The emphasis will be on new initiatives by international regulatory agencies to inject risk management techniques into the development and use of medical devices. Also the course will discuss the risk management model, process, steps, regulations, assessment and identification. Covered topics include: Enterprise risk, Total quality management (TQM), Performance improvement (PI), Failure mode and effect analysis (FMEA), Corrective and preventive action (CAPA), Risk analysis–ISO/IEC 14971, Root cause analysis (RCA).		

BIOM 632	Health-care Facility Management	3(3,0)
This course presents procedures followed for medical and health services management. It covers duties of administrator and his assistants, as well as work flow between staffs of different services and departments. It emphasis on credentials, quality control, human resources, finances, recovery, insurance, sterilization, infection control and health safety procedures. Prerequisite: BIOM 421.		

BIOM 633	Medical Technology & Ethics	3(3,0)
This course introduces students to the ethical dilemmas and challenges that have emerged with the positive outcomes of biomedical engineering regarding its responsibility in developing new treatment modalities that have significantly improved medical care, the quality of life for patients. The course will stress on the involvement of humans in clinical research, the definition of death and the issue of euthanasia, the animal experimentation and human trials for new medical devices, the patient access to sophisticated and high cost medical technology, and the regulation of new biomaterials and devices. Covered topics include: professions, sources of professional ethics, professional integrity, responsibility, code, euthanasia, animal experimentation, regulation of medical device innovation, ethical issues in emergency use, ethical issues in treatment use, the safe medical devices act. Prerequisite: BIOM 531.		

BIOM 651	Medical Informatics and Artificial Intelligence	3(3,0)
This course describes the growth of bioinformatics field, its complexity and content. It will consist of two parts. The first defined as none artificial intelligence decision making and devoted to areas that form a key “core” of computer technologies such as hospital information systems (HIS), computer-based patient records (CPR), communications and standards. The second parts correspond to artificial intelligence based topics containing expert systems, knowledge-based systems neural networks. Covered topics include: Patient Database Strategies, Patient Management, Clinical Decision Support Systems, and Computer Networks		

in Health Care, HL7, PACS, Decision Theoretic Models, Statistical Models, Decision Making, Artificial Neural Networks, Training Algorithms, Clinical Decision Systems, and Expert System Process Model.

BIOM 652	Bio-computation
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3(3,0)

This course refers to several areas of research at the boundary between computation and biology. The emphasis will be on computational biology, natural computing via use of naturally inspired computing models to solve mathematical problems, and the attempt to exploit biomolecules and cells to perform computations. It will focus on DNA computing, in which one uses DNA molecules and their interactions to perform computations, as well as recent promising models such as membrane computing. Covered topics include: DNA sequencing, Polymerase chain reaction (PCR), Adleman's experiment, Stranded DNA, DNA computing on surfaces, Genomic data base and Bio-computational Models.

BIOM 653	Biometrics
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3(3,0)

This course deals with the automatic recognition of individuals based on statistical analysis of physiological and/or behavioral characteristics. The emphasis will be on biometric characteristic defined as human physiological or behavioral characteristic that is unique, universal, stable, and collectable. Covered topics include: biometric system structure, verification system, identification system, feature extraction, matching, decision, performance evaluation, finger print, palm print, face, iris, hand vein thermogram, DNA, ear, odor, etc....

Artificial Organs

BIOM 641	Prostheses
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3(3,0)

This course describes fundamentals of substitutive medicine. It stresses on the interest of an engineered device or the transplantation of organs, tissues, or cells ability to substitute for most of organs and body functions. Highlight on categories, types, nature and principles of different artificial organs will be given. Covered topics include: Heart Valve Prostheses, Vascular Grafts, Hyperplasia, Graft Infections Liver Support Systems, Nerve Guidance Channels, ENT Replacement Devices, Artificial Blood, and artificial skin. **Prerequisite:** BIOM 519.

BIOM 642	Transport Phenomena
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3(3,0)

The intention of this course is to couple the concepts of transport phenomena with chemical reaction kinetics and thermodynamics to introduce the field of reaction engineering. It encompasses the subjects of momentum transport (viscous flow), energy transport (heat conduction, convection, and radiation), and mass transport (diffusion). The media in which the transport occurs is regarded as continua; however, some molecular explanations are discussed. The continuum approach is of more immediate interest to engineers, but both approaches are required to thoroughly master the subject. Covered topics include: Microvascular Heat Transfer, Interstitial Transport in the Brain, Arterial Wall Mass Transport, and Concepts of Biomimicry. **Prerequisite:** BIOM 542.

BIOM 643	Genetic and Tissue Engineering	3(3,0)
<p>This course introduces students to the unprecedented insight into the inner workings of the most basic structures of living tissues due to the information revealed by revolutionary undertakings, such as the human genome project. The attention will be focused on manipulating molecular architecture structures for therapeutic purposes. It will describe the techniques that have been developed to transplant genetic material into a variety of living tissues. Also, will be discussed the ability of affecting the future of many areas of disease treatment by developments in the field of tissue engineering. Covered topics include: transgenic animals, DNA microinjection, embryonic stem (ES) cell technology, cloning, tissue regeneration, fluid-induced shear, micropipette aspiration, chondrocytes, scaffold materials, protein coating. Prerequisite: BIOM 416.</p>		

Mechanical Engineering Program

The following study plan summarizes the courses and credit distribution for the Masters of Science (MS) in Mechanical Engineering. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits
ENGR 600	Engineering Research Methods	3
MECH 690	Capstone Research Project (non-thesis option)	3
MECH 695A	Thesis I (thesis option)	3
MECH 695B	Thesis II (thesis option)	3
MECH 6xx	Technical Elective I	3
MECH 6xx	Technical Elective II	3
MECH 6xx	Technical Elective III (non-thesis option)	3
MECH 6xx	Technical Elective IV (non-thesis option)	3

A. Engineering Research Methods

The research methodology course is mandated by the MEHE. This course must be taken by all MS bound students. However the specific experiences organized around the general topics may be tailored to meet program's need. The description of the Engineering required course is described below.

ENGR 600	Engineering Research Methods	3(3,0)
<p>This course introduces students to quantitative and qualitative methods for engaging in meaningful research. The student, at the end of the course, will attain skills in research intent and design, methodology and technique, format and presentation, and data management. Throughout the course, the student's ability to use this knowledge to become a more effective researcher will be developed. In particular, the student will be able to develop a hypothesis about a research problem and develop related questions; frame the problem with the correct research methodology; collect data that accurately addresses the research problem; measure the effectiveness of a solution methodology; analyze data to make informed decisions; provide technical documentation of all the phases of a research project; evaluate feasibility of research proposals; and present data to support decisions in front of stakeholders.</p>		

B. Research Project/Thesis

MECH 690	Capstone Research Project	3(3, 0)
<p>A capstone course requiring group work in one of the emphasis areas offered by the Department. The project is to be carried out under the supervision of a full-time faculty member and culminated in a formal written and oral report (refer to college guidelines</p>		

related to graduation projects structure and content). **Prerequisite:** Accepted petition to graduate.

MECH 695A	Master Thesis I	3(3, 0)
Includes guided review of research literature and/or pilot work relevant to the thesis topic. By the end of this course the candidate for the MS degree should have established a hypothesis, a research methodology and a work schedule for the completion of his/her thesis. A brief, written report is expected at the end of the course and should be approved by the research advisor(s). (This course may be repeated only once to accomplish its objective). Prerequisite: Accepted petition to graduate.		

MECH 695B	Master Thesis II	3(3, 0)
Continuation of MECH 695A, Includes the completion and submission of a research thesis, the quality of which is judged acceptable by the jury committee established in accordance with the College of Engineering and Graduate Committee guidelines. (This course may be repeated only once to accomplish its objective). Prerequisite: MECH 695A.		

C. Elective Courses

As part of the program for the Masters of Science in Mechanical Engineering, the student is required to take a total of 6 credit hours (9 credit hours for non-thesis option) of 600 level technical elective courses. These courses allow the student to attain an in-depth knowledge and understanding in a focus area of interest. The student who chooses the non-thesis option can mix and match elective courses from the different areas to acquire broader knowledge of different Mechanical Engineering disciplines. The thesis option student should select, in coordination with the thesis advisor, the set of electives that best meet the requirements for successful completion of his/her thesis. The MECH available technical elective courses are distributed in two areas:

1. Mechanical Design and Manufacturing
2. Energy and Thermo-fluid Systems

It is highly recommended that students take 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 the approval of the thesis committee. The list of recommended technical electives is given below.

Course #	Title	Credits	Prerequisites
Mechanical Design and Manufacturing			
MECH 601	Advanced Mechanics of Materials	3	MECH 320
MECH 602	Pressure Vessel and Piping Design and Analysis	3	
MECH 606	Fatigue and Fracture Mechanics Design and	3	MECH 320; MECH 421

	Evaluation		
Energy and Thermo-fluid Systems			
MECH 603	Combustion Engineering	3	MECH 334
MECH 604	Solar Energy	3	MECH 330 or MECH 333
MECH 605	Turbomachinery	3	MECH 335
MECH 607	Advanced Heat Transfer	3	MECH 431

Course Descriptions

Mechanical Design and Manufacturing

MECH 601	Advanced Mechanics of Materials	3(3,0)
3-D Stress tensor and invariants; constitutive models; theories of failure for ductile and brittle materials; plane stress/plane strain elasticity; unsymmetrical bending of straight beams; shear center for thin-walled cross-sectional beams; bending of curved beams and rings; axisymmetric geometry and loading; elasto-plastic analysis of thick-walled cylinders and autofrettage & shrink-fitting residual stresses; rectangular & circular thin plates; circular thick plates; Beam on elastic foundation theory and practice use of Roark's formula. Prerequisite: MECH 320. On demand.		

MECH 602	Pressure Vessel and Piping Design & Analysis	3(3,0)
Stress analysis and evaluation of thin-walled pressure vessels and piping components; material properties and temperature limit; design philosophy of ASME Section VIII, Division 1; design philosophy of Section VIII, Division 2; design calculations using Section VIII, Division 1; design calculations using B 31.3 Piping code; flange selection based on P/T ratings – ASME/B 16.5 / 16.47 standards; fabrication, inspection and testing of pressure vessels; safety valves; in-service inspection & monitoring; practical applications; design project. On demand.		

MECH 606	Fatigue and Fracture Mechanics Design and Evaluation	3(3,0)
Material properties; stress intensity calculation; Brief S-N method used in non-pressurized mechanical components design: S-N method used in pressurized mechanical components design; effects of cracks and notches; fundamental of linear elastic fracture mechanics (LEFM) principles; crack-tip stress intensity factor calculations; fracture toughness evaluation; codes & standards; crack growth models, the use of finite element method in evaluating fatigue crack propagation life. Prerequisite: MECH 320 and MECH 421. On demand.		

Energy and Thermo-Fluid Systems

MECH 603	Combustion Engineering	3(3,0)
Fuels and their properties; review of basic thermodynamics and gaseous mixtures; combustion thermodynamics: stoichiometry; the first and second Laws of thermodynamics applied to combustion; composition products in equilibrium; fundamentals of combustion; applications. Prerequisite: MECH 334. On demand.		

MECH 604	Solar Energy	3(3,0)
Solar geometry for stationary and tracking systems; solar energy availability and measurement; radiative, conductive and convective heat transfer pertinent to simple solar collectors; flat plate collectors and concentrators; energy storage; project. Prerequisite: MECH 330 or MECH 333. On demand.		

MECH 605	Turbomachinery	3(3,0)
This course involves the design of turbo-compressors. It includes: Review of thermo-fluids; compressible flow; diffusion processes; centrifugal compressors; swept vanes; velocity triangles; slip factor; axial compressors; stage pressure rise; stage reaction and loading; compressor map and performance; blockage factor; aerofoil aerodynamics; tip clearance; CFD and axial compressor design projects. Prerequisite: MECH 335. On demand.		

MECH 607	Advanced Heat Transfer	3(3,0)
Derivation of energy and mass conservation equations with constitutive laws for conduction, convection, radiation, and mass diffusion; dimensional analysis; heat exchangers; boiling and condensation. Prerequisite: MECH 431. On demand.		

Mechatronics Engineering Program

The following study plan summarizes the courses and credit distribution for the Masters of Science (MS) in Mechatronics Engineering. The following study plan serves as a roadmap for a smooth progression toward graduation.

Course #	Title	Credits
ENGR 600	Engineering Research Methods	3
MECA 690	Capstone Research Project (non-thesis option)	3
MECA 695A	Thesis I (thesis option)	3
MECA 695B	Thesis II (thesis option)	3
MECA 6xx	Technical Elective I	3
MECA 6xx	Technical Elective II	3
MECA 6xx	Technical Elective III (non-thesis option)	3
MECA 6xx	Technical Elective IV (non-thesis option)	3

A. Engineering Research Methods

The research methodology course is mandated by the MEHE. This course must be taken by all MS bound students. However the specific experiences organized around the general topics may be tailored to meet program's need. The description of the Engineering required course is described below.

ENGR 600	Engineering Research Methods	3(3,0)
This course introduces students to quantitative and qualitative methods for engaging in meaningful research. The student, at the end of the course, will attain skills in research intent and design, methodology and technique, format and presentation, and data management. Throughout the course, the student's ability to use this knowledge to become a more effective researcher will be developed. In particular, the student will be able to develop a hypothesis about a research problem and develop related questions; frame the problem with the correct research methodology; collect data that accurately addresses the research problem; measure the effectiveness of a solution methodology; analyze data to make informed decisions; provide technical documentation of all the phases of a research project; evaluate feasibility of research proposals; and present data to support decisions in front of stakeholders.		

B. Research Project/Thesis

MECA 690	Capstone Research Project	3(3, 0)
A capstone course requiring group work in one of the emphasis areas offered by the Department. The project is to be carried out under the supervision of a full-time faculty member and culminated in a formal written and oral report (refer to college guidelines related to graduation projects structure and content). Prerequisite: Accepted petition to graduate.		

MECA 695A	Master Thesis I	3(3, 0)
Includes guided review of research literature and/or pilot work relevant to the thesis topic. By the end of this course the candidate for the MS degree should have established a hypothesis, a research methodology and a work schedule for the completion of his/her thesis. A brief, written report is expected at the end of the course and should be approved by the research advisor(s). (This course may be repeated only once to accomplish its objective). Prerequisite: Accepted petition to graduate.		

MECA 695B	Master Thesis II	3(3, 0)
Continuation of MECA 695A, Includes the completion and submission of a research thesis, the quality of which is judged acceptable by the jury committee established in accordance with the College of Engineering and Graduate Committee guidelines. (This course may be repeated only once to accomplish its objective). Prerequisite: MECA 695A.		

C. Elective Courses

As part of the program for the Masters of Science in Mechatronics Engineering, the student is required to take a total of 6 credit hours (9 credit hours for non-thesis option) of 600 level technical elective courses. These courses allow the student to attain an in-depth knowledge and understanding in a focus area of interest. The student who chooses the non-thesis option can mix and match elective courses from the different areas to acquire broader knowledge of different Mechatronics Engineering disciplines. The thesis option student should select, in coordination with the thesis advisor, the set of electives that best meet the requirements for successful completion of his/her thesis. The MECA available technical elective courses are distributed in two areas:

1. Automation
2. Mechanisms and Robotics

It is highly recommended that students take 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 the approval of the thesis committee. The list of recommended technical electives is given below.

Course #	Title	Credits	Prerequisites
Automation			
MECA 601	Systems Engineering	3	MECH 470
MECA 602	Multi Agent System MAS	3	
MECA 607	Manufacturing System & Supply Chain Design	3	MECH 422
MECA 608	Mechatronics Drives	3	
Mechanisms and Robotics			
MECA 603	Advanced Robotics	3	MECA 544
MECA 604	Design of Mechanisms	3	MECH 321

MECA 605	Spatial Mechanisms	3	MECA 541
MECA 606	Compliant Mechanisms	3	MECH 520; MECH 571

Course Descriptions

Automation

MECA 601	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: MECH 470.		

MECA 602	Multi Agent System MAS	3(3,0)
The objective of the course is to present tools and methodologies for performing system Realization in a multidisciplinary design context. Focus will be equally strong on all three aspects of the problem: (i) the multidisciplinary character of engineering systems, (ii) design of these complex systems, and (iii) tools for realization. Prerequisites: Instructor's consent.		

MECA 607	Manufacturing System & Supply Chain Design	3(3,0)
This course focuses on decision making for system design, as it arises in manufacturing systems and supply chains. Students are exposed to frameworks and models for structuring the key issues and trade-offs. It also introduces various models, methods and software tools for logistics network design, capacity planning and flexibility, make-buy, and integration with product development. Industry applications and cases illustrate concepts and challenges. Prerequisite: MECH 422.		

MECA 608	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.		

Mechanisms and Robotics

MECA 603	Advanced Robotics	3(3,0)
Current technology on robotics, sensing, and vision; Basic knowledge on how to make intelligent autonomous mobile robots using AI concepts; trajectory planning and obstacle		

avoidance; use of software packages, sensors, image acquisition and processing; autonomous mobile robots; applications of mobile robots; tele-robotics; future trends. **Prerequisite:** MECA 544.

MECA 604	Design of Mechanisms	3(3,0)
Mobility analysis of mechanisms; kinematic chains and inversions; precision synthesis techniques (graphical and analytical methods); introduction to different optimization techniques; optimum synthesis of mechanisms using gradient-based and global intelligent optimization methods; creative mechanism design project. Prerequisite: MECH 321. Annually.		

MECA 605	Spatial Mechanisms	3(3,0)
General mobility criteria; describing spatial displacements; formulation of the kinematic equations; kinematic analysis and synthesis of spherical and spatial mechanisms; optimum synthesis of spherical and spatial kinematic chains; kinematics of robotic manipulators. Prerequisite: MECA 541.		

MECA 606	Compliant Mechanisms	3(3,0)
Nonlinear beam theory; pseudo-rigid body model (PRBM); Flexible link model (FLM); synthesis of partially compliant mechanisms using PRBM and FLM; synthesis of fully compliant mechanisms (rigid body displacement and kinetostatic synthesis); finite element application; size, shape and topology optimization; research project. Prerequisite: MECH 520, MECH 571.		

Faculty List

Abdallah, Mirvat; Assistant Professor, PhD in Civil Engineering, 2013, Lille 1 University, France.

Al Awar, Nizar; Lecturer, MS in Electrical Engineering, 2003, Marquette University, USA.

Al Hajj, Ahmad; Associate Professor, PhD in Civil Engineering, 1993, University of Pittsburgh, USA.

Al Wardany, Riad; Assistant Professor, PhD in Civil Engineering, 2005, University of Sherbrooke, Canada.

Basha, Hisham; Professor and Dean, PhD in Civil Engineering, 1994, University of Michigan, USA.

Diab, Mohammad; Associate Professor, PhD in Biomedical Engineering, 2007, University of Compiègne, France.

Diab, Nadim; Assistant Professor, PhD in Mechanical Engineering, 2013, American University of Beirut, Lebanon.

Hammoud, Roula; MD, 1991, Université Libre de Bruxelles, Belgium.

Haydar, Mazen; Lecturer, PhD in Civil Engineering, Environmental Engineering, 2005, Michigan State University, USA.

Hijazi, Toufic; Professor, PhD in Electrical Engineering, 1988, Clarkson University, USA.

Kasamani, Jihad; Instructor, MS. In Mechanical Engineering, 1989, American University of Beirut, Lebanon.

Khatib, Rabih; Instructor, MS. in Civil Engineering, Transportation, 2002, University of Balamand, Lebanon.

Khatib, Rami; Lecturer, MS in Mechatronics Engineering, 2012, Rafik Hariri University, Lebanon.

Kozaily, Jad; Assistant Professor, PhD in Material Science, 2012, Université d'Orléans, France.

Mechaymech, Ahmad; Lecturer, PhD in Civil Engineering, Concrete Technology, 2010, University of Sherbrooke, Canada.

Moslem, Bassam; Assistant Professor, PhD in Signal Processing, 2011, University of Compiègne, France.

Mounajed, Ghassan; Lecturer, PhD in Civil Engineering, 1991, Ecole Nationale des Ponts et Chaussées, Paris- France.

Nasreddine, Jad; Associate Professor, PhD in Computer Science, 2004, University of Rennes 1, France.

Nuwayhid, Rida; Professor, PhD in Mechanical/Nuclear Engineering, 1989, Imperial College, UK.

Sabbah, Maher; Ph.D, 2006, Biomedical Engineering, University of Technology of Compiègne (UTC) France and Université Claude Bernard, Lyon, France.

Sawan, Jihad; Lecturer, PhD in Civil Engineering, Geotechnical & Highway Engineering, 1978, University of Illinois at Urbana Champaign, USA.

Serhal, Dina; Assistant Professor, PhD in Communications Engineering, 2009, University of Limoges, France.

Taha, Mohammed; Associate Professor, PhD in Electrical engineering, 1992, Aston University, UK.

Zantout, Rached; Associate Professor, PhD in Communications Engineering, 1994, Ohio State University, USA.

Zeidan, Ali; Lecturer, PhD in Civil Engineering - Hydraulics, 1991, University of Khartoum, Sudan.

Graduate Studies Forms

PROPOSED PLAN OF STUDY

This form should be filled out by the student and his/her advisor before the start of the second term of studies. The student will commit to a MS track (Thesis or Project), plan of study and courses to be taken. The form shall be used to follow the progress of the student until graduation.

Student Name		ID #	
Undergraduate Degree		Institution	
Major		Proposed Degree	
MS Track	<input type="checkbox"/> Thesis track <input type="checkbox"/> Project track	Graduate Advisor	

Proposed Thesis/Project Title			
Thesis/Project Committee¹			
Role	Name	Signature	Date
Chair			
Member			
Member			
Member			

Category	Course #	Course Name	Where?	When?	# Credits	Grade
Background Courses (credits do not count toward degree)						
Transfer Credits (12 credits maximum)						
Mandatory Courses						

Elective Courses						
600 level	500 level	Total Credit Hours that count toward the degree				

¹ Optional for project track

THESIS PLAN

This form should be filled out by students on thesis track to plan for the thesis defense.

Student Name		ID #	
Major		Proposed Degree	
MS Track	<input type="checkbox"/> Thesis track <input type="checkbox"/> Project track		

Thesis/Project Title and Summary

Tentative Dates to Complete Milestones	
Thesis/Project Defense	
Graduation Date	

Thesis/Project Committee (optional for Project Track)			
Role	Name	Signature	Date
Chair			
Member			
Member			
Member			

Approvals			
	Name	Signature	Date
Department Chairperson			
College Dean (for the CGSC)			

THESIS DEFENSE

This form should be completed by the thesis committee chair and kept in the students' file.

Student Name		ID #	
Major		Proposed Degree	
Thesis Title			
Date final thesis/project copy is submitted to the committee			
Thesis/Project Defense Date			
Thesis/Project Defense Results	<input type="checkbox"/> Outstanding (specify below) <input type="checkbox"/> Satisfactory <input type="checkbox"/> Additional Work needed		
Thesis/Project Committee Approvals			
Role	Name	Signature	Date
Chair			
Member			
Member			
Member			
Thesis/Project Committee Chair's Remarks			
Date:		Signature:	

Approvals			
	Name	Signature	Date
Department Chairperson			
College Dean (for the CGSC)			

ASSESSMENT OF GRADUATE STUDENT'S PERFORMANCE

Student Name		ID #	
Major		Degree	

Undergraduate Degree			
Major		Institution	
GPA		Class of	

Prior Practical Experience	
Years of Experience	
Type of Experience	

Graduate Studies			
Major			
Enrollment Date		Graduation Date	
GPA		Thesis Advisor	
Thesis Title			

Performance Evaluation
Rate the student on a scale from 1 to 4 (1 being minimally acceptable) on the basis of the following criteria:
a. Ability to conduct independent research and generate ideas ()
b. Creativity and critical thinking ()
c. Writing skills ()
Overall Assessment of Graduate performance (Thesis Advisor)
<div style="height: 150px; border: 1px solid black;"></div>
<div style="display: flex; justify-content: space-between;"> <div>Date:</div> <div>Signature:</div> </div>

MS REQUIREMENTS COMPLETION CHECKLIST

This form shall be completed by the GSRC coordinator and kept in the student's permanent record for future reference, assessment of graduate program and quality assurance measures.

Student Name		ID #	
Enrollment Date			
Graduation Date			
Academic Advisor			
Thesis/Project Advisor			
Thesis/Project Title			
Thesis/Project Sponsor			

Graduate Studies Form	Date Completed
GS-1	
GS-2	
GS-3	
GS-4	

Date thesis/project submitted to the Library	
Signature of the Librarian	

Role	Name and Signature	Date
Thesis/Project Committee Chair		
Department Chair		
College Dean (for the CGSC)		
GSRC Coordinator		
Registrar		