



*American University of Beirut*

*Faculty of Engineering and  
Architecture*



# Annual Report

Department of Mechanical  
Engineering

*Academic Year 2006-2007*

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## From the Chair



The past year has been marked by the consequences of the summer 2006 war on Lebanon. Efforts to retain faculty and students and then carry the heavy academic load catering for teaching load of courses, lab needs, in an understaffed department, with a reduced budget while finding qualified teaching faculty to replace those who were granted temporary leaves. During July and August, many requests were received from current students for recommendations to enable them to relocate. But in September almost all of our students returned for registration and were committed to complete their degrees at AUB. Despite these difficulties, ME faculty and staff have pulled together putting their efforts to create a great supporting environment to our students and to the university. It was after

all a positive year with many achievements and with dedication to help the community through several projects related to reconstruction effort. The other difficulty faced by the department was moving the ME labs from Wings C and B to the CCC Science and Research Building (CCC-SRB) in the middle of the year rather than during the summer when it had been planned. A loss of research time and lab course instruction occurred due to the move into a smaller lab space. This is a temporary problem that will be solved when the new Oxi-Irani Engineering Labs building is complete by 2009. The CCC-SRB ME lab space has a much nicer work environment and meets safety regulations for lab buildings.

During the academic year 2006-07, Profs. Abdallah and Khalaf took leaves without pay for one year, Profs. Shihadeh and Lakkis were on paid research leaves during the spring semester, and two newly appointed faculty members chose not to join the department. This created an unpredicted additional load for the remaining faculty who had to keep up with their academic duties and still deliver quality teaching, continue to work diligently on their research projects and supervise graduate students. Some full-time faculty taught three courses during one semester and some ME faculty had to supervise three or four Final Year Projects with four students per project. The department offered for the first time an online course at AUB. MECH 799 Design Methodology was taught by Prof. Gerge Fadel from Clemson University. The course provided the students with an opportunity to be exposed to state-of-the-art design methods and take responsibility on their learning since the course required students to do a lot of reading outside the class and adhere strictly to submittal deadlines of term papers and assignments. The student's project were evaluated by Prof. Fadel when he visited AUB during the last two weeks of the spring semester.

In January 2007, the move of ME labs from Wings B and C to the new CCC Science and Research Building took place. The move needed close coordination among lab personnel, faculty members teaching lab courses, FPDU, and the contractor. Prof. Shihadeh coordinated this effort and despite careful planning, delays have taken place in installing equipment and preparing services for these equipment in the new location. Some classes had to cancel certain experiments and students were no longer able to use the shop for their projects until early March 2007. The lab staff have done an amazing job following equipment move and installation in place and looking after every single order to service equipment in time for use in classes for the spring semester 2007 and for the FYP's. The new lab space, although well equipped, it extremely crowded for ME labs. The current area in the temporary location in SRB

is no more than 40% than the original lab area the ME department had. This situation is temporary until the new Oxi-Irani FEA Labs Building is completed by 2009.

Despite all these difficulties, the department celebrated this year the registration of its new PhD program at NY State Department of Education in January 2007 and the approval of AUB to start the PhD programs in FEA next fall of 2007. This is a milestone in the history of the ME department and it will mark a notable start of long term research that can bring recognition to AUB and advance knowledge that serves the community and the region. The PhD program is expected to help attract and retain excellent young scholars to the ME program.

On the bright side, ME departments has received two major TEMPUS grants valued at 994,000 Euros for a duration of three years. Out of three Lebanon-based projects funded by the European Commission in 2007, the Department of Mechanical Engineering (ME) in the Faculty of Engineering and Architecture at AUB received two. The EU framework, TEMPUS, sponsors projects for curriculum development. The two ME projects are:

- 1. Innovative Curriculum in Sustainable Energy (ICOSE):** This project aims to revive and develop a graduate program in sustainable energy (ICOSE) which will be led by Profs. Ghaddar and Moukalled (support is up to 492,000 Euros of which 150,000 Euros is designated for lab equipment to establish an energy systems lab for buildings in AUB). The EU project partners are Lund University (Grant Holder, Sweden), Kungliga Tekniska Högskolan (KTH, Sweden), and Aegean University.
- 2. Academic Curriculum in Manufacturing Engineering (ACME):** This project, conceived by Prof. Ramsey Hamade, aims to start an undergraduate minor and a graduate concentration in manufacturing in the department. Total support is up to 430,461 Euros of which 122,000 Euros are designated to help establish a manufacturing center. The EU project partners are University of Naples Federico II Piazzale (Grant Holder, Italy), Cardiff University (UK), Università degli studi di Salerno (Italy), and the Ecole Nationale d'Ingenieurs de Trapes (ENIT, France).

In addition to the above, external research funding for new grants have also been awarded to the ME faculty from ASHRAE (USA), the Swedish Research Council-MENA, IDRC (Canada), the Arab Science and Technology Funds, and the Lebanese National Council for Scientific Research (LNCSR) for a total amount exceeding \$380,000.

This year the ME department introduced the new position of Lab Technical Manager. The position was filled after a thorough search; Mr. Samir Berjaoui started at the lab on April 2, 2007. Mr. Berjaoui will be a key person in assuring the high quality of operations in the lab and in supporting teaching and research in the department.

Three new faculty members will join the department during the academic year of 2007-08: Dr. Firas Sammoura from UC Berkeley, Dr. Daniel Asmar from the University of Waterloo, and Dr. Mutassem Shehadeh from the University of Washington in Seattle.

The ME faculty continues to be recognized for their outstanding scholarly work. Professor Ghaddar was appointed Associate Editor of the *ASME Journal of Applied Mechanics (JAM)*; the appointment is from September 2006 through August of 2009.

The Petrofac Graduate Fellowship valued at \$12,500/year was awarded to an ME graduate student, Amer Abdul-Aziz, who joined the ME graduate program in the fall of 2006. The Sakkal Renewable Energy Graduate Thesis Award to promote research in the field of renewable energy and energy efficiency (RE) with special applications to Lebanon, valued at \$3,000 per year, was awarded to the ME graduate student Mounir Mossolly who will be completing his master's degree in the summer of 2007. For the fourth year in a row, the FEA Abdul-Hadi-Debs Graduate Award for Academic Excellence in Research was awarded to a mechanical engineering graduate student. This year Ihab Sraj received the award.

Our research facilities were upgraded with the addition of a rotating four component dynamometer. This is a new acquisition brings in a novel and critical capability to the area of metal cutting and compliments the existing CNC machinery. It adds the ability to measure the force generated and the power needed for machining metal.

The ME department continues to take great pride in the quality of its graduates. This annual report presents a modest picture of the achievements of the ME/FEA during 2006-07, highlighting the activities and accomplishments of the faculty staff, and the students. For more information you can refer to the web site: <http://webfea.fea.aub.edu.lb/fea/med/>

I would like to express final thanks to our departmental secretary Ms. R Abdel Rassoul who compiled and prepared this report and to FEA Assessment Officer Mrs. B. Magreevy who edited this report.

Nesreen Ghaddar  
Department Chairperson

## Full Time Faculty

*Marwan Darwish*; Professor, PhD, Brunell University. Area of interest: engineering materials and computations.

*Nesreen Ghaddar*; Qatar Chair in Energy Studies, Professor and Chairperson, PhD, MIT. Areas of interest: heat and moisture transport in fibrous materials, thermal comfort, optimization of energy systems performance, and energy conversion.

*Fadl Moukalled*; Professor and Associate Dean for Academic Affairs, PhD, Louisiana State University. Area of interest: computational fluid dynamics.

*Albert Kuran*; Associate Professor, MS, Yale University.

*Samer Abdallah*; Assistant Professor, PhD, University of Sydney. Areas of interest: robotics and computer vision (on leave).

*Ramsey Hamade*; Assistant Professor, PhD, Virginia Polytechnic Institute. Areas of interest: design, materials, and manufacturing.

*Kinda Khalaf*; Assistant Professor, PhD, Ohio State University. Area of interest: biomedical engineering (on leave).

*Issam Lakkis*; Assistant Professor, PhD, MIT. Areas of interest: analysis, modeling, and design of RF MEMS devices; system level modeling of MEMS; design and analysis of RF circuits and systems.

*Ghanem Oweis*; Assistant Professor, PhD, University of Michigan, Ann Arbor. Area of interest: computational fluid mechanics.

*Alan Shihadeh*; Assistant Professor, PhD, MIT. Areas of interest: power engineering and combustion.

## Part-Time Faculty

*Pierre Azoury*; Professor, PhD, University of London.

*Kamel Abu-Ghali*; Lecturer, Associate Professor at BAU, PhD, Kansas State University.

*Jihad Kasamani*; Lecturer, ME, AUB.

*Wajih Najm*; Lecturer, ME, AUB.

*Ahmad Farshoukh*; Assistant Instructor, BE, AUB.

*Rami Jabakhanji*; Instructor, ME in Civil and Environmental Engineering, AUB.

*Charbel Seif*; Instructor, ME, AUB.

## **Non-Academic Personnel**

*Rana Abdel Rassoul* ; Department Secretary

## **ME Lab Personnel**

*Samir Berjaoui*; Mechanical Engineering Labs Technical Manager, MS, LSU.

*Hisham Ghalayini*; ME Lab Supervisor

*Dori Rouhana*; Senior Technician

*Roger Said*; Mechatronic Lab Master

## **Engineering Shops Personnel**

*Joseph Nassif*; Shops Supervisor

*Ramzi Safi*; Senior Technician

*George Jurdi*; Senior Shop Master

*Joseph Zoulikian*; Materials and Manufacturing Lab Master

*Joseph Khoury*; Senior Technician

## **New Appointments**

*Ali El-Ammouri*, Assistant Instructor, BE, Beirut Arab University.

*Daniel Asmar*, Lecturer, PhD, University of Waterloo in 2006. Areas of interest: robotics, mechatronics, and computer vision.

*Samir Berjaoui*, ME Lab Manager and Lab Instructor, holds a master's degree in computer engineering from the University of Louisiana at Lafayette, USA. He has over twenty years experience in electronic analog and digital circuit design. He consulted for the oil industry in Texas and Louisiana for more than fifteen years, designing instruments that operate at temperatures as high as 200 degrees C with a precision of less than 0.1 ppm. He is the co-inventor of three patents registered with the United States Patent and Trademark Office. His expertise is in the field of ultrasound ranging used for fluid level measurement.

*George Fadel*, Adjunct Professor, Clemson University. *Georges Fadel* joined Clemson University in 1992 from Georgia Tech where he taught from 1989 to 1992. He previously worked in Europe and in the Middle East developing and using large simulation codes. Dr. Fadel is the co-director and founder of the CREDO Laboratory (<http://www.ces.clemson.edu/me/credo/>) and is a member of the ASME, SAE, AIAA, ISSMO, the Design Society, and Toastmasters. Dr. Fadel's research efforts target the design process from early conception to pre-production. They identify and develop theories and methodologies to deal with complex multi-disciplinary and multi-objective design problems. The methodologies are applied to packaging problems (under hood of a car, satellites, avionics, etc.), and to heterogeneous and layered materials manufacturing. The fields of optimization, simulation and analysis, and CAD are essential to these methodologies and are the foundations of supporting work in virtual and physical prototyping, which led to work in collaborative design.

*Fadi Hamdan*, Lecturer, PhD, Imperial College, London. He acts as a consultant to companies in the UK and the Middle East and North Africa (MENA) region, working on various projects related to the design, re-assessment and strengthening of offshore structures and onshore oil and gas plants in the context of reducing major hazards. Dr Hamdan was the manager at the Steel Construction Institute (SCI,UK) with responsibility for business development in the offshore and specialist engineering division. Prior to that, he worked at BOMEL (UK) on a variety of projects related to offshore structures in the North Sea and the Caspian Sea. Dr Hamdan has considerable experience in hazard management and risk reduction, structural analysis, fluid and soil structure interaction, steel structures and structural dynamics. He is a chartered member of the Institution of Structural Engineers (IStructE) and the Royal Institution of Naval Architects (UK). Dr Hamdan has delivered international in-house seminars at Halliburton, McDermott, Mustang, Technip, and ABB in Houston, and to several oil companies in Nigeria and Bahrain on various structural issues including protection of offshore structures against fires and explosions.

*Najib Metni*, Lecturer, PhD, Université de Nice Sophia-Antipolis and Laboratoire Centrale des Ponts et Chaussées, Paris, France. He obtained his Bachelor of Engineering in Mechanical Engineering from the American University of Beirut (AUB), Lebanon. Najib received a Masters of Engineering in Industrial Control from Université de Technologie de Compiègne (UTC), France and a PhD from University of Nice-Sophia Antipolis. He conducted his Ph.D. research at the Laboratoire Central des Ponts et Chaussées (LCPC) in Paris. He spent five months as a visiting scholar at University of New Mexico, USA. His research interests are in linear and non-linear control theory, sensor fusion, visual servoing and unmanned aerial vehicles (UAV).

## ME Statistics Academic Year 2006-2007

	No. of Students
<b>Undergraduate Student Enrollment</b>	
1 <sup>st</sup> year	75
2 <sup>nd</sup> year	92
3 <sup>rd</sup> year	82
4 <sup>th</sup> year	79
<b>Graduate Students</b>	30
<b>Students Graduating in October 2006</b>	
BE (Major ME)	6
Master's Degree (Major ME)	4
<b>Students Graduating in February 2007</b>	
Bachelor of Engineering (Major ME)	5
Master's Degree (Major ME)	3
<b>Students Graduating in June 2007</b>	
Bachelor of Engineering (Major ME)	64
Master's Degree (Major ME)	1
<b>Transfer Students Accepted from outside AUB to ME</b>	
Fall 2006	9
Spring 2007	4
<b>Transfer Students from within AUB to ME</b>	
Total Fall and Spring (Sophomore & Freshmen)	27
<b>Transfer Students from within FEA to ME</b>	
Fall 2006	12
Spring 2007	4
<b>Students who Transferred from ME to other FEA Majors</b>	
Fall 2006	6
Spring 2007	1

<b>Graduate Student Enrollment</b>	
Summer 2006	11
Fall 2006-07	22
Spring 2007	22
<b>Graduate Assistants (GAs)</b>	
Summer 2006	8
Fall 2006-07	13+2 from EM Program
Spring 2007	15+3 from EM Program
<b>Research Assistants (RAs)</b>	
Academic year 2006-2007	16

## **Graduate Assistant Appointments**

The following eighteen students were appointed as graduate assistants during the academic year 2006-07.

- |                      |                          |
|----------------------|--------------------------|
| 1. Adnan Akhadar     | 10. Moh'd Kayyaji        |
| 2. Amer Abdel-Aziz   | 11. Moh'd Al-Othmani     |
| 3. Aram Kazandjian   | 12. Moh' Baydoun         |
| 4. Bassel Jreije     | 13. Mounir Mossolly      |
| 5. Habib Abou Saleh  | 14. Nancy Daher          |
| 6. Joe Rached        | 15. Nareg Karaogklianian |
| 7. Lina Kassis       | 16. Ralph Saade          |
| 8. Maan Hamdan       | 17. Wadih Geahchan       |
| 9. Moh'd Hajj Hassan | 18. Ziad Haddad          |

## **Student Employment**

In the Student Study Program, twenty registered undergraduate ME students were selected under the Specialized Work category for the academic year 2006-07. Their work assignments included clerical work, help in research and lab experiments, developing material for the website and similar tasks. The selection is based on merit and departmental need. The students who participated in the work study program are:

- |                          |                        |
|--------------------------|------------------------|
| 1. Abdel Fatah Al Shafie | 11. Mario Saad         |
| 2. Adnan Mortada         | 12. Michelle Daoud     |
| 3. Ali Nour Eddine       | 13. Moheddine El Jamal |
| 4. Bassel Mikati         | 14. Omar Hamasni       |
| 5. Ibrahim Hanna         | 15. Rami Oueni         |
| 6. Ibrahim Manasfi       | 16. Rami Hammad        |
| 7. Jad El-Sebaaly        | 17. Sherif Kassatly    |
| 8. Joseph Kanaan         | 18. Tarek Abou Ammo    |
| 9. Jules Abou Abdallah   | 19. Wafaa Karaki       |
| 10. Khaled Farhat        | 20. Wassim Abdul-Baki  |

## Appointments of Research Assistants

### Academic year 2006-07

Student Name	Project Title	Supervisor
Ziad Haddad	Artificial Intelligence for CAD	Hamade
Jack Abboud	Laser Induced Bubbles	Oweis
Wadea Gehchan	Multi Grid Coupling of Independently Mashed Interface	Darwish
Bassel Jreije	Simplified Thermal Model with Experiments for Designing Displacement Ventilation and Chilled Ceiling Systems in Humid Climates	Ghaddar
Nancy Daher	Particle Deposition in Idealized Mouse-Throat	Shihadeh
Habib Abou Saleh	Aluminum drilling	Hamade
Elie Kfoury	Grid-Free Computations of Buoyant Flow Around an Isothermal Cylinder	Petrofac
Ralph Saadeh	Design and Optimization of CC/DV System Operation	Ghaddar
Adnan Akhdar	Combining population balance equation to CFD through homogenous and non homogenous MUSIG	Moukalled
Maan Hamdan	Development of a Robust Landmine Detection System Using Multi-Sensor Fusion of Infra-red Imaging, Ground Penetrating Radar, and Acoustics Signals	Abdallah/Asmar
Nareg Karaogklianian	Boundary Layer Studies	Oweis
Mohamad Al-Othmani	Bioheat Modeling with Asymmetric Radiation Field	Ghaddar
Mohammed Baydoun	Development of a Robust Landmine Detection System Using Multi-Sensor Fusion of Infra-red Imaging, Ground Penetrating Radar, and Acoustics Signals	Ghaddar
Mounir Mossolly	Simplified Thermal Model with Experiments for Designing Displacement Ventilation and Chilled Ceiling Systems in Humid Climates	Ghaddar
Rawad Saleh	Evaporation and Condensation of Aerosol in a Constant Wall Temperature Pipe Plug Flow	Shihadeh
Amer Abdul-Aziz	A Fully Coupled Finite Volume Method for Fluid Flow at All Speeds	Darwish

## **New ME Courses**

The following new courses were approved by the FEA Academic Committee and were offered during the academic year 2006-07

### **MECH 200: Mechanical Engineering Tools** (3 credits = 1.5 L + 1.5 Lab)

The course introduces students to the mechanical engineering discipline, builds the student's interpersonal and communication skills, and gives them insight about engineering concepts and creative design principles. It is an overview of engineering as a profession, and ethics in engineering introducing students to the creative process of identifying needs and then devising practical solutions to fill those needs through designing, building, integrating, testing and evaluating an engineering product. Teamwork experience is heavily stressed and students are introduced to representative software and hardware tools that they are likely to utilize in the process of product development. Instructor: Prof. Ramsey Hamade.

### **MECH 220: Engineering Graphics** (1 credit)

An introductory course on 2-D drawing, orthogonal projection, auxiliary views, sectioning and sectional views, dimensioning and tolerance schemes, standard drawing layouts, and an introduction to the use of AutoCAD. A pre- or co requisite is MECH 200. The course will be offered annually. Instructor: Mr. Cherbel Seif.

### **MECH 230: Dynamics** (3 credits)

A course on kinematics and kinetics of particles, systems of particles, and rigid bodies in 2-D and 3-D motion, Newton's laws, work and energy, impulse and momentum, impact, and mass moments of inertia. The pre- or co requisites are Math 201 and CIVE 210. Instructor: Mr. Wajih Najm.

### **MECH 518: Environmental Challenges in Managing Ozone Depleting Substances**

(3 credits)

An introduction to environmental issues related to engineering through a review of selected multilateral agreements and, in particular, a review of the Montreal Protocol with emphasis on compliance strategies and discussion of the current status of ozone depleting substances (ODS). Students will explore available technologies that work best now with a look to future technologies and alternatives. Applications are related to fire fighting, aerosols, solvents, foams and pesticides. Management of ODS programs, good practices and safety issues will be covered. The prerequisite is MECH 310 Thermodynamics or the equivalent. Instructor: Prof. Fadl Moukalled.

The ME department developed and offered this course to raise awareness of environmental challenges in managing ozone depleting substances (ODS). The course development was sponsored by United Nations Environment Programme (UNEP) - Regional Office for West Asia, (ROWA). The idea for developing this course originated when a joint workshop by ASHRAE, UNEP, AUB and KU was held at AUB on December 2005. The workshop was attended by many practicing engineers; ASHRAE members; and junior, senior, and graduate students from many universities. It was clear at the workshop that much work needed to be done to raise awareness on ways to manage and replace ODS.

The main goal of this prototype course is to bring technical assistance and compliance with the Montreal Protocol directly into the classrooms of potential professionals. The course was developed and implemented with the following objectives:

- Create awareness among under-graduate students regarding environmental concerns related to selected multilateral environmental agreements in general and the Montreal Protocol in particular.
- Develop in students the skills needed to evaluate the impacts of ODS alternatives on systems performance.
- Expose students to relevant codes of practice for management and safety.

The students who successfully completed the course received a certificate from UNEP.

**MECH 519: Compressible Flow** (3credits)

This course covers general one-dimensional flow of a perfect gas; homenergetic and homentropic flow in nozzles and constant area ducts; normal shock waves, and one-dimensional unsteady gas flow. The prerequisite is MECH 310. Instructor: Prof. Azoury.

**MECH 798: Special Topics in Mechanical Engineering: Design Methodology** (3credits)

Study and nurturing of creativity, thought processes as well as decision-making processes for design. It includes an in-depth study of the mechanical design process and tools. These include QFD, concurrent design, systematic design, robust design, DFA, and axiomatic design. Instructor: Professor George Fadel.

This course was taught online from Clemson University. The students met once a week for a two-hour live lecture from Clemson University in South Carolina. Extensive use of Moodle to access the lectures and for communication with the instructor was involved. Professor Fadel visited the ME department during the last two weeks of the semester to assess student projects and complete the final grading of assignments. The students have highly rated their learning in the course. This course was also an opportunity for the FEA IT Unit to setup the RCR room for communication using Breeze software.

The following graduate course was approved and will be offered in the fall of 2007-08:

**MECH 707: Statistical Mechanics and Thermodynamics** (3 credits)

This course examines the basic principles of statistical mechanics and their relation to the laws of thermodynamics and the concepts of temperature, work, heat, and entropy; the microcanonical, canonical, and grand canonical distributions; the applications to lattice vibrations, ideal gas, photon gas, quantum statistical mechanics; the Fermi and Bose systems, , and interacting systems. Instructor: Prof. Lakkis.

## ME– Faculty Workload Summary

<b>Summer 2006</b>			
<b>Instructor</b>	<b>Course No.</b>	<b>Course Name</b>	<b>No. of Students</b>
Abou Ghali, K.	MECH 310	Thermodynamics	15
Darwish, M.	MECH 340-1	Engineering Materials	30
Smaili, A.	MECH 430-1	Instrumentation and Measurements	38
Darwish, M.	MECH 431-1	Dynamic System Analysis	38
Smaili, A.	MECH 431-2	Dynamic System Analysis	30
ME Faculty	MECH 500	Approved Experience	84
Shihadeh, A.	MECH 796	Special Project in ME	1
Ghaddar N.	MECH 796	Special Projects in ME	3
ME Faculty	MECH 799	Thesis	6
ME Faculty	MECH 799A	Thesis	1
ME Faculty	MECH 799B	Thesis	6

<b>Fall 2006-07</b>			
<b>Instructor</b>	<b>Course No.</b>	<b>Course Name</b>	<b>No. of Students</b>
Hamade, R.	MECH 200	ME Tools	93
Seif, C. Farshoukh, A	MECH 220	Engineering Graphics	79
Lakkis, I.	MECH 310	Thermodynamics I	39
Abou-Ghali, K.	MECH 310	Thermodynamics I	43
Seif, C. Farshoukh, A	MECH 320	Introduction to Engineering CAD	88
Shihadeh, A. Ammouri, A. Baydoun, M.	MECH 410L	Thermal Fluids Lab	76
Hamade, R. Ammouri A. and Merhej F.	MECH 421	Manufacturing Processes I	22
Darwish, M. Ammouri A. and Merhej F.	MECH 421	Manufacturing Processes I	55
Shihadeh, A.	MECH 311	Thermodynamics II	83
Kuran, A.	MECH 432	Mechanics of Machines	77
Ghaddar, N	MECH 510	Thermal of Systems Design	40
Abou-Ghali, K	MECH 510	Thermal of Systems Design	42

**Fall 2006-07**

Instructor	Course No.	Course Name	No. of Students
Darwish, M.	MECH 520	Mechanical Design II	26
Asmar, D.	MECH 520	Mechanical Design II	53
Moukalled, F.	MECH 513	HVAC	34
Azoury, P.	MECH 514	Gas Turbines	43
Oweis, G.	MECH 609	Experimental Methods in Fluid Dynamics	6
Lakkis, I.	MECH 707	Micro Flows Fundamentals and Applications	12
Asmar, D.	MECH 645	Noise and Vibration Control	11
Darwish, M.	MECH 663	Computational Fluid Dynamics	18
ME Faculty	MECH 797	Seminar	15
Khalaf, K.	MECH 799A-1	Thesis	1
Shihadeh, A.	MECH 799A-2	Thesis	1
Darwish, M.	MECH 799A-3	Thesis	2
Hamade, R.	MECH 799B	Thesis	2
Moukalled, F.	MECH 799C	Thesis	2
Lakkis, I.	MECH 799C	Thesis	1

**Spring 2007**

Instructor	Course No.	Course Name	No. of Students
Seif, C, Ammoury A. and Farshoukh A.	MECH 220 (1,2,3)	Engineering Graphics	95
Najm, W Kasamani, J.	MECH 230 (1&2)	Dynamics	82
Oweis, G.	MECH 411-1	Fluid Engineering I	35
Oweis, G.	MECH 411-1	Fluid Engineering I	61
Hamade, R Ammouri, A. Farshoukh, A.	MECH 321	ME Tools	75
Darwish, M.	MECH 340	Engineering Materials	55
Asmar, D. Farshoukh, A. Berjaoui, S.	MECH 430	Instrumentation and Measurements	48
Kuran, A.	MECH 312	Applied Thermodynamics	64
Abou Ghali, K.	MECH 412	Heat Transfer	73

<b>Spring 2007</b>			
<b>Instructor</b>	<b>Course No.</b>	<b>Course Name</b>	<b>No. of Students</b>
Hamdan, F.	MECH 420	Mechanical Design I	78
Asmar, D. Farshoukh, A.	MECH 433	Control and Automation	73
Moukalled, F.	MECH 518	Ozone Depleting Substances	28
Azoury, P.	MECH 519	Compressible Flow	27
Hamade, R.	MECH 522	Computer Aided Design	21
Metni, N. Berjaoui, S.	MECH 530	Mechatronics	20
Kuran, A.	MECH 531	Engineering Vibration	42
Darwish, M.	MECH 736	Modeling Solidification Processes	9
Ghaddar, N.	MECH 761	Convection Heat Transfer	16
Hamade, R.	MECH 624	Mechanics of Composite Materials	4
Metni, N.	MECH 648	Nonlinear Control Systems	3
Fadel, G.	MECH 798	Special Topics in ME: Design Methodology	12
Darwish, M.	MECH 431- Tutorial		2
Moukalled, F.	MECH 796	Special Project in ME	2
Shihadeh, A	MECH 799	Thesis	1
Ghaddar, N.	MECH 799	Thesis	3
Ghaddar, N.	MECH 799A	Thesis	1
Hamade, R.	MECH 799A	Thesis	1
Abdallah, S.	MECH 799A	Thesis	1
Hamade, R.	MECH 799B	Thesis	1
Khalaf, K.	MECH 799C	Thesis	1
Hamade, R.	MECH 799C	Thesis	1

## Distribution of Load in Academic Year 2006-2007

Name	Number of Students					Number of Students					Number of Students					Total
	Summer 2006					Fall 2006-07					Spring 2007					
	1st	2nd	3rd	4th	Grad	1st	2nd	3rd	4th	4th & Grad	1st	2nd	3rd	3rd/4th	4th & Grad	
Abdallah, S.										1 thesis					1thesis	1
Abu-Ghali, K.		15					43		42				73			131
Asmar, D.									53	11		48	73			185
Azoury, P.									43					27		70
Darwish, M.		68						55	26	18		55		2	9	233
Fadel, G.															12	12
Ghaddar, N.									40						16 + 4 theses	60
Hamdan, F.													78			78
Hamade, R.						93		22		2 theses				21	4+3 theses	143
Khalaf, K.															1 thesis	1
Kuran, K.								77						106		183
Lakkis, I.							39								12 + 1 thesis	52
Metni, N.													20	3		23
Moukalled, F.									34	2 theses				30		66
Oweis, G.										6		96				102
Seif, C.						79	88				95					262
Smaili, A.		68														68
Shihadeh, A.					1 sp. pro			159		1 thesis					1 thesis	161

## **Final Year Projects 2006-07**

The department hosted twenty three Final Year Projects. Projects varied from exterior hands on experience to simulation and modeling experience. Eight of these projects were published as papers in the 6<sup>th</sup> FEA Student Conference proceedings.

### **1. Molecular Dynamics Simulator for Solvated Protein**

Carla Bahri, Marc Ghossoub, and Hiba Shheitle  
Advisor: Lakkis, I.

### **2. SEESAW**

Joyce Chamoun, Imad Nasr, Abdul Rahman Saleh, and Noura Soueid  
Advisor: Asmar, D.

### **3. Aerial localization of Mines using computer Vision**

Jules Abou Abdallah, Roy Abou Tayeh, Elie Fares, and Ola Knio  
Advisor: Asmar, D.

### **4. Rube-Goldberg**

Thierry Aoun, Nadeem Ghanem, and Joseph Nabhan  
Advisor: Asmar, D.

### **5. Wind Turbine**

Nader Chouman, Christopher Milan, Ahmad Ramadan, and Mohamed Zaweel  
Advisor: Darwish, M.

### **6. Turbine Simulation**

Houssein Abou Saleh, Rami Oueini, and L'Emir Rawad Chehab  
Advisor: Darwish, M.

### **7. Automated Hanger Chain Process Machine**

Hrayr Jarkhedian, ECE;, and Henry Younis  
Advisor: Darwish, M.

### **8. Design and Implementation of an Intelligent Car-Following Collision Prevention Controller**

Nasser El-Ghossaini, Assad Tahhan, Ali Hinnawi, Claude Abou Daher  
Advisor: Saadeh, J.

### **9. Mine Detection Vehicle**

Elie Baaklini, Ralph El Khoury, Jad Kahawaty, and Ibrahim Maalouf  
Advisor: Ghaddar, N.

### **10. Development of Design guideline charts for chilled ceiling and displacement ventilation system (CC/DV)**

Maher Itani, Amer Keblawi, Ibrahim Manasfi, and Nibal Nehme  
received the Dean's Award for Creative Achievement  
Advisor: Ghaddar, N.

### **11. Thermal and flow field in an enclosure cooled by chilled ceiling and displacement ventilation by experimentation and simulation**

Amin El Khechen, Khalid Farhat, Marwan Morcos Hayek, and Naji Nahra  
Advisor: Ghaddar, N.

### **12. Hydrogyn Fuel Cell**

Wassim Abdul Baki, Jad El Sebaaly, Ibrahim Hanna, and Faycal Hjeily

Advisor: Hamade, R.

**13. Zap-a-Bug**

Mark Ghanem, Michel Moukarzel, Ramzi Naiman El Hage, and Youssef Zoghzoghi

Advisor: Hamade, R.

**14. Remotely Operated Vehicle or Underwater Rover**

Gilbert Chahine, Samer Charbel, Mounir El Asmar, and Gilbert Haddad

Advisor: Hamade, R.

**15. Techno-Economic Study of Solar Water Heating.**

Ali Al Aridi, Nareg Demirdjian, Alexander Geha, and Wassim Murr

Advisor: Kuran, A.

**16. Absorption Fridge**

Moheddine El Jamal, Houssam El Masri Sidani, Omar Hamasni, and Mohammed Mikati

Advisor: Kuran, A.

**17. Brake Pads Performance Testing Machine**

Hani Houalla, Mahmoud Madhoun, and Ahmad Sinno

Advisor: Moukalled, F.

**18. Cavitation in Propeller**

Peguié Abou Arraj, Amer Al Bukhari, Louis Darwiche, and Nizar Fakih

Advisor: Moukalled, F.

**19. Temperature & Carbon Dioxide Control TCDC**

Nasr Elie, and Marwan Sawma

Advisor: Moukalled, F.

**20. Renewable Systems for South Lebanon**

Wael Abdel Samad, Ali Nour Eddine, and Ali Sadek

Advisors: Moukalled, F. and N. Ghaddar

**21. Industrial Ice Factory**

Samer Bou Ali, Antonios El Haddad, Patrick El Hawa, and Jad Itani

Advisor: Moukalled, F.

**22. A Pulsed Heart Simulator Machine for Biomedical Research**

Jean Michel Daher, Elias Njeim, and Mario Saab

Advisor: Oweis, G.

**23. Friction Drag Reduction through Groove Implementation**

Lucien Hamze, Jaafar Khalifeh, Assaad Mohanna, and Jad Panayoti

Advisor: Oweis, G.

*The FYP coordinator for the 2006-07 academic year were Profs. Alan Shihadeh and Prof. Ramsey Hamade. Presentations of projects took place on May 17, 2007 in the presence of ME faculty members and students.*

## Research Grants

### Internal Research Grants (URB) – October 1, 2006 – September 30, 2007

	Project Title	PI	Amount in USD
1	A Coupled Pressure-Density-Velocity Variables Solver for All-Speed Flow Simulation	M. Darwish	5,200
2	Design and Construction of a Vibration-Assisted Setup for Micromachining	R. Hamade	5,800
3	Effect of the Displacement Rate in Uniaxial Testing on the Biomechanical Properties of the Skin of the Rat	T. Bazi, and R. Hamade	15,000
4	A Heterogeneous MUSIG Model for the Prediction of Mixing and Evaporation of Poly-Dispersed Sprays in Supersonic Flows	F. Moukalled	5,200
5	PIV Measurements of the Sub-Layer in a Turbulent Boundary Layer	G. Oweis.	4,800

### Lebanese National Council for Scientific Research

	Project Title	PI	Amount in LL	Duration
1	Development of a Tool to Improve Casting Quality and Yields Part II	M. Darwish	7,500,000	January 1, 2006 – December 31, 2006
2	Simplified Thermal Model with Experiments for Designing Displacement Ventilation and Chilled Ceiling Systems in Humid Climates	N. Ghaddar	7,500,000	October 1, 2006 – September 30, 2007
3	Assessment of Air Quality in Beirut Following Israeli Assault	A. Shihadeh	7,500,000	October 1, 2006 – September 30, 2007

### Other External Research Funding

	Project Title	PI	Funding Agency	Amount in USD	Duration
1	Experimental Study of a Combined Solar Desalination and Air-Conditioning Unit	N. Ghaddar	American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE)	\$5,900	August 1, 2007 – July 31, 2008
2	Displacement Ventilation and Chilled Ceiling – Design, Control, and	N. Ghaddar and Lars Jensen	The MENA – Swedish Research Links Programme	\$43,000	January 1, 2007 – December

	<b>Project Title</b>	<b>PI</b>	<b>Funding Agency</b>	<b>Amount in USD</b>	<b>Duration</b>
	Experiment	(Lund Univ.)			31, 2009
3	Renewable Energy Technologies II Policy Outline (RETs II) for Poverty Alleviation in the Region: Jordan – Lebanon – Syria	N. Ghaddar (P.I.), M. Fadel, F. Moukalled, and K. Karaki	Global Network for Sustainable Energy Development (UNEP)	\$25,000	September 1, 2005 – November 31, 2006
4	Simplified Thermal Model with Experiments to Design Optimized Chilled Ceiling and Positive Displacement Ventilation System	N. Ghaddar, K. Ghali, and W. Chakroun	American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE)	\$79,200	September 1, 2006 – August 31, 2008
5	Innovative Curriculum on Sustainable Energy – ICOSE	N. Ghaddar F. Moukalled J. Arfvidsson (Lund Univ.)	European Commission on Education and Culture (TEMPUS)	Euro 492,000	March 18, 2007 - March 18, 2010
6	ACME – Curriculum Development for a Minor in Manufacturing	R. Hamade  Teti (Napoli, Italy)	European Commission on Education and Culture (TEMPUS)	Euro 422,000	March 18, 2007 - March 18, 2010
7	The Liquid Micro-Jet from Laser Induced Cavitation Bubbles for Surgical and Engineering Applications	G. Oweis	Arab Science and Technology Foundation (ASTF)	\$31,000	September 15, 2006 – September 15, 2008
8	Consequences of Involuntary Exposure to Narghile Smoke	A. Shihadeh	Research for International Tobacco Control / IDRC Canada.	\$196,709	October 1, 2006 - September 30, 2009

## Publications

### Journal Papers

1. Saleh<sup>s</sup>, R. and **Shihadeh, A.** “Hygroscopic Growth and Evaporation in an Aerosol with Boundary Heat and Mass Transfer: Dimensional Analysis and Experimental Investigation,” *Journal of Aerosol Science*, 38:1-16, 2007.
2. **Darwish, M.**, Sraj, I, and **Moukalled, F.**, “A Coupled Incompressible Flow Solver on Structured Grids,” *Numerical Heat Transfer, Part B*, in press.
3. Bazi, T., **Hamade, R. F.**, Abi Nader, K. “Polypropylene Midurethral Tapes Do Not Have Similar Biologic And Biomechanical Performance in the Rat,” *European Urology*, Vol 51/5, 1364-75, 2007.
4. **Hamade, R. F.**, Artail, H. A., and Sikström, S. “Correlating Trainee Attributes to Performance in 3D CAD Training,” *Journal of European Industrial Training*, Vol. 31(2), 112-26, 2007.
5. Ghali K., **Ghaddar N.**, and Ayoub M. (S). “Chilled Ceiling and Displacement Ventilation System: An Opportunity for Energy Saving in Beirut.” *International Journal of Energy Research*, in press, 2007.
6. Ghali K., **Ghaddar N.**, and Salloum M. (S), “Effect of Stove Asymmetric Radiation Field on Thermal Comfort Using a Multi-segmented Bioheat Model,” *Buildings and Environment*, in press, 2007.
7. **Moukalled, F.** and **Darwish, M.**,” Buoyancy Induced Heat Transfer in a Trapezoidal Enclosure with Offset Baffles,” *Numerical Heat Transfer, Part A*, in press.

### Conference Papers

- 1- **N. Ghaddar**, F. Moukalled, R. Chedid, M. Fadel. T. Mezher, A. Hamzeh, A. Harb, and F. Abdulla, “Renewable Energies Technologies Contribution and Barriers to Poverty Alleviation in Jordan, Syria, and Lebanon.” Proceedings of The Arab Regional Solar Energy Conference (ARSEC 2006), 5-7 November 2006, University of Bahrain, Kingdom of Bahrain, pp. 64-66.
- 2- **N. Ghaddar**, K. Ghali, and B. Jreije, “Ventilation of Wind-Permeable Clothed Cylinder Subject to Periodic Swinging Motion.” Accepted for presentation and will appear in the proceedings of the 2007 ASME-JSME Thermal Engineering Conference and Summer Heat Transfer Conference, July 8-12, 2007, Vancouver, BC, Canada.
- 3- M. Katurji<sup>3</sup> and **A. Shihadeh**. “*In Situ* Carbon Monoxide, ‘Tar,’ and Topography Measurements for 20 Narghile Waterpipe Smokers in Natural Settings Using a Novel Smoke Sampling Device,” 13<sup>th</sup> Annual Meeting of the Society for Research on Nicotine and Tobacco, Austin, TX, February 2007.
- 4- **A. Shihadeh**, S. Rustom, M. Katurji, W. Maziak, T. Eissenberg, and K. Ward. “Effect of Mainstream Smoke CO Concentration and Puff Duration on CO Boost in Waterpipe Smokers,” World Conference on Tobacco or Health, Washington, DC, July 2006.
- 5- **R.F. Hamade**, H. Artail, “Performance Assessment of 3D Mechanical CAD Training at the American University of Beirut,” ICEET-2-1017, Kuwait, April 8-11, 2007.
- 6- **R.F. Hamade**, **N. Ghaddar**. A Student-Centered, Two-Course Series in Mechanical Design at the American University of Beirut,” ICEET-2-1007, Kuwait, April 8-11, 2007.
- 7- W. Chakroun, S. Almutawa, **N. Ghaddar**, **F. Moukalled**, A. El-Tallony, “A Regional Collaboration Effort to Incorporate Contemporary Issues into Engineering Curriculum: The Case of Managing Ozone Depleting Substances.” *Proceedings of the 2<sup>nd</sup> International Conference on Engineering Education and Training (ICEET-2)* – April 9-11, 2007, Kuwait.

- 8- **Darwish, M. and Moukalled, F.**, "A Coupled Finite Volume Linear Elasticity Solver," ICFD2007, Conference on Numerical Methods for Fluid Dynamics, University of Reading, March 26-29, 2007.
- 9- Winkel, E., **Oweis, G. F.**, Vanapalli, S., Dowling, D. R., Perlin, M., Solomon, M., Ceccio, S. L., "Friction Drag Reduction at High Reynolds Numbers Using Injected Polymer Solutions," 26th ONR Symp. Naval Hydrodynamics, Rome, Italy, September 2006.

## Reports

**Ghaddar, N. and Moukalled, F.** "Renewable Energy Systems to Meet Domestic Energy Needs in the Reconstruction Plans of South Lebanon Villages," COMPANY: United Nations Environment Programme (UNEP) - Regional Office for West Asia, (ROWA), May 2007.

## Professional Magazine Article

**N. Ghaddar**, "Combined Chilled Ceiling and Displacement Ventilation, Construction Engineer," the *Magazine for Building Services, Civil and Structural Engineers*, page 40, March/April 2007 issue.

## Department Seminars and Presentations

*13C Polarizer Automation Story*, presented on May 10, 2007 by **Dr. Abdulrahman Al-Khalidy** from General Electric Global Research.

*Micromachined Plastic Millimeter-wave Radar Components*, presented on April 12, 2007 by **Dr. Firas Sammoura**, AUB graduate, with a PhD from the University of California at Berkley.

*Sustainable Machining through Power Reduction: Determining Cutting Force Distributions and Coefficients from Dry Drilling Experiments*, presented on December 6, 2007 by **Prof. Ramsey Hamade**, ME faculty member. MECH 797 series.

*Recent Advances in the Finite Volume Method*, presented on November 29, 2006 by **Prof. Marwan Darwish** ME faculty member. MECH 797 series.

*Vision-Inertial SLAM using Natural Features in Outdoors Environments*, presented on October 31, 2006, by **Dr. Daniel Asmar**, ME part-time faculty member. MECH 797 series.

*Landmine Detection System Using Fusion of Normal Vision and Infra-Red Imaging*, presented on December 5, 2006, by **Mr. Mohammad Baydoun**, ME Graduate Student. MECH 797 series.

*Data Fusion Between Inertial Sensors and Visual Information Applied on Flying VTOL Vehicles*, presented on November 28, 2006 by **Dr. Najib Metni**, ME part-time AUB faculty member MECH 797 series.

*Recent Development in 2D and 3D Vortex Methods*, presented on November 7, 2007 by **Prof. Issam Lakkis**, ME faculty member. MECH 797 series.

## **Paper Reviews**

The ME faculty members reviewed articles for the following international journals.

### **Darwish, M.**

1. Numerical Heat Transfer (2 articles)

### **Ghaddar, N.**

1. Journal of Energy Engineering, ASCE (1 article)
2. ASME Journal of Applied Mechanics (3 articles)
3. ASME Heat Transfer Journal (1 article)
4. International Journal of Thermal Sciences (5 articles)
5. International Journal of Energy research. (2 articles)
6. Heat Transfer Engineering (1 article)
7. 2<sup>nd</sup> International Conference on Engineering Education & Training (4 articles)
8. URB proposals (2 proposals)
9. As Associate Editor of the ASME Journal of Applied Mechanics, Prof. Ghaddar coordinated the review process of more than 12 articles for the ASME Journal of Applied Mechanics.

### **Hamadeh, R.**

1. International Journal of Machine Tools and Manufacture (2 articles)
2. Journal of Applied Mechanics (1 article)
3. Material Science and Engineering **A** (1 article)

### **Lakkis, I.**

1. ASME Journal of Applied Mechanics (1 article)

### **Moukalled, F.**

1. Numerical Heat Transfer (1 article)
2. International Journal for Numerical Methods in Fluids (2 articles)
3. International Journal of Refrigeration (1 article)
4. Heat Transfer Engineering (1 article)
5. ASCE Journal of Energy in Engineering (1 article)
6. ASME Journal of Applied Mechanics (1 article)

### **Oweis, G.**

1. ASME Journal of Fluids Engineering (1 article)
2. ASME Journal of Applied Mechanics (1 article)

### **Shihadeh, A.**

1. Nicotine and Tobacco Research (2 articles)
2. Journal American Medical Association (1 article)
3. ASME Journal of Applied Mechanics (1 article)

## **Consultancy Work**

### **Profs. N. Ghaddar and F. Moukalled**

1. Developing course material to raise awareness on environmental challenges in managing ozone depleting substances (ODS). The course title is: “Environmental Challenges in Managing Ozone Depleting Substances.” COMPANY: United Nations Environment Program (UNEP) - Regional Office for West Asia, (ROWA). April – September, 2006.
2. AUB Energy Audit Project; S. Karaki (PI), F. Chaaban, F. Moukalled, and N. Ghaddar. The objective of the project is to recommend a long-term energy policy to promote energy conservation and reduce energy costs. Starting Date: March 1, 2006
3. “Renewable Energy Systems to Meet Domestic Energy Needs in the Reconstruction Plans of South Lebanon Villages” COMPANY: United Nations Environment Program (UNEP) - Regional Office for West Asia, (ROWA) – December 1 – June 1, 2007.

## **Committees and Community Service**

### **Prof. Darwish**

1. University Graduate Study Ad hoc Committee
2. FEA Graduate Studies Committee (chair)
3. Member of Organizing Committee of 6th Annual FEA Student Conference

### **Prof. Ghaddar**

1. FEA ABET Committee (2004-06)
2. Member of FEA Academic Committee (2001-2007)
3. Member of FEA Administrative Committee (2001-2007)
4. Member of FEA Strategic Planning Committee
5. Member of FEA Space Committee
6. FEA Petroleum Ad hoc Committee
7. AUB Committee on Discrimination and Harassment
8. Member of AUB Self-Study Design Committee (2006-07) and Co-chair of Standard 10 on Faculty
9. Member of University Learning Outcomes Coordinating Committee (2006-07)
10. Co-facilitated a workshop on preparation of teaching portfolio for faculty with Prof. Jamali and Prof. Boujaoudi on Dec. 1, 2006
11. Co-facilitated a workshop on preparation of teaching portfolios for faculty with Prof. Tabbal and Prof. Boujaoudi on Feb. 23, 2007
12. Chaired a session at the Second International Conference on Engineering Education, organized by the College of Engineering and Petroleum at Kuwait University in Kuwait, April 9-11 2007
13. Associate Editor of ASME Journal of Applied Mechanics (2006-2009)
14. Member of the Editorial Board of the International Journal of Green Energy

**Prof. Hamade**

1. FEA Academic Committee (Fall 2006-07)
2. FEA Admissions Committee (2005-07)
3. FEA Research Committee
4. Commencement Committee, ME Marshal
5. Editorial Advisory Board Member (EAB) of the Journal of Adhesion Science and Technology (JAST) (January 2006- January 2009)

**Prof. Kuran**

- 1- Teaching Effectiveness Committee
- 2- FEA Student Affairs Committee (Spring)

**Prof. Lakkis**

1. Secretary of the FEA Student affairs Committee (Fall)

**Prof. Moukalled**

1. FEA Academic Committee
2. FEA Administrative Committee
3. FEA ABET Committee (Chair)
4. FEA Strategic Planning Committee
5. FEA Admissions Committee
6. Unified Admissions Committee
7. FEA Commencement Committee (Chair)
8. FEA Ad hoc Math Committee
9. Campus Bookstore Committee
10. Petroleum Engineering Committee
11. AUB Policies and Procedures Review Committee (PPRC)
12. FEA Physical Space Committee
13. University Learning Outcomes Coordinating Committee (ULOCC)
14. AUB Task Force for Reconstruction

**Prof. Oweis**

1. ME Lab Manager Hiring Committee
2. Administered two comprehensive exams for the master's students
3. FEA Faculty Secretary
4. FEA Academic Committee (Spring)

**Prof. Shihadeh**

1. FEA Academic Committee (Fall)
2. FEA Coordinator of SRB Lab Move (Summer and Fall)

## Faculty Development

### ME Short-Term Faculty Development Grants

Name	Conference	Duration
Darwish, M.	ICFD 2007: Conference on Numerical Methods for Fluid Dynamics, University of Reading, London	March 26 - 29, 2007
Ghaddar, N. and Hamade, R.	2 <sup>nd</sup> International Conference on Engineering Education and Training (ICEET-2), Kuwait	April 9 – 11, 2007
Ghaddar, N.	ASME-JSME Thermal Engineering Conference and Summer Heat Transfer Conference, Vancouver, Canada	July 8 – 10, 2007
Ghaddar, N.	ASHRAE Conference	July 10 – 12, 2007
Ghaddar, N.	The Arab Regional Solar Energy Conference (ARSEC)	November 5 – 7, 2006
Hamade, R.	Performance Assessment of 3D Mechanical CAD Training at the AUB, ICEET – 2 – 1017, Kuwait	April 8 – 11, 2007
Moukalled, F.	The fourth MEA and North Africa Renewable Energy Conference – MEMAREC 4 Damascus, Syria	June 21 – 24, 2007
Moukalled, F.	IUTAM Symposium on Recent Advances in Multiphase flows: Numerical and Experimental, Istanbul, Turkey	June 11 – 14, 2007

### ME Long-Term Faculty Development Grants

Name	Conference	Duration
Hamade, R.	Research at University of Kentucky, Lexington, USA	June 15 – August 15, 2006
Lakkis, I.	Paid Research Leave	June 20, 2006 – Sept. 20, 2007. Feb 1, 2007 – Sept. 10, 2007
Shihadeh, A	Paid research leave (UT A&M)	Feb 1, 2007 – September 30, 2007.

## Thesis

### Approved Theses

Graduate students whose master's thesis proposals were approved by the FEA Graduate Studies Committee, during the academic year 2006-07

Student Name	Thesis Title	Thesis Supervisor
Mounir Mossolly	Optimal Control Strategy for a Displacement Ventilation Combined with a Chilled Ceiling HVAC System Using Genetic Algorithm	Ghaddar, N.
Moh'd Baydoun	Robust Infrared Imaging System for Landmine Detection	Ghaddar, N.
Moh'd Al Othmani	A Multi-Segmented Bioheat Model of the Human Body with Asymmetry	Ghaddar, N.
Elie Kfoury	Effect of Ventilation Periodicity on Carbon Monoxide Formation in a Transient Forward Smoldering Char Bed	Shihadeh, A.
Bassel Jreije <i>Defended in June 2007</i>	Three Dimensional Periodic Ventilation Model Through Clothing System for a Walking Man	Ghaddar, N.
Maan Hamdan	Detection of Partially Occluded Surface-Laid Explosives Using Vision and Infra Red	Abdallah, S. and Asmar D.
Balsam Nehme <i>Defended in February 2007</i>	System Level Modeling of Microfluidic Devices	Lakkis, I.
Ihab Sraj <i>Defended</i>	A Fully Coupled Finite Volume Method for Fluid Flow at All Speeds	Darwish, M.
Chafic Mansour <i>Defended</i>	A Finite Volume Solid Mechanics Solver	Darwish, M.
Hussein Al Sayyed <i>Defended</i>	Formulation and Implementation of a Numerical Model for the Simulation of Evaporation of Injected Liquid Droplets into a Gas Flowing at Supersonic Speed	Moukalled, F.
Zeina Alwan <i>Defended</i>	Combining Population Balance Equation to CFD through the MUSIG (Multi-Size-Group) Model in Predicting Supersonic Turbulent Mixing and Evaporation	Moukalled, F.
May Khalil <i>Defended</i>	Coagulation, Phase Change, and Deposition Dynamics in the Narghile Waterpipe	Shihadeh, A.
Marwan Katerji <i>Defended in October 2007</i>	Development Of A Portable Closed Loop Control Isokinetic Sampling System to Assess Toxicant Exposure of Waterpipe Smokers in Natural Settings	Shihadeh, A.
Ibrahim Geha	Acoustic and Siesmic Sensing of Burried Object and Landmining	Smaili, A.
Ahmad Al Masalkhi Farshoukh	Design of an Intelligent Hypoxia Chamber Controller for InVivo and InVitro Biomedical Experimentation	Khalaf, K.

## Thesis Supervision

ME faculty members are supervising the master's theses of the following current students who will be submitting proposals in 2007-08.

<b>Student Name</b>	<b>Thesis Supervisor</b>
Amer Abdel Aziz	Darwish, M.
Adnan Akhdar	Moukalled, F.
Ziad Haddad	Hamade, R.
Joe Rached	Darwish, M.
Nancy Daher	Shihadeh, A.
Moh'd Al Saad	Hamade, R.
Camile Ziadeh	Hamade, R.
Ali Al Ammouri	Hamade, R.
Wadeah Gehchan	Darwish, M.
Farid Merhej	Hamade, R.
Nareg Kara	Oweis, G.
Jack Abboud	Oweis, G.
Ralph Saade	Ghaddar, N.

## Awards

### FEA Annual Student Conference Awards

*FEA Distinguished ME Alumnus Award for the academic year 2006-07 went to Professor Wael Yared.*



**Dr. Yared receives Award from Dean Hajj**

Dr. Wael Yared graduated from the Mechanical Engineering Department of FEA/AUB in 1983 and received his PhD in Mechanical Engineering (Robotics) from the Massachusetts Institute of Technology in 1988. He was then appointed a Research Fellow at MIT and taught a graduate seminar on Control Systems. Currently he is the Vice President of Imaging Systems in VisEn Medical Company, Cambridge, MA, US. Dr. Yared oversees the technical and commercial development of the Fluorescence Molecular Tomography (FMT) imaging platform. Prior to joining VisEn, he held senior management positions at the Cambridge Strategic Management Group and with Arthur D. Little, Inc., where he led a number of worldwide technology-based consulting assignments with imaging, medical products, semiconductor and telecommunications industries. His clients have included Fortune 500 companies; start-up firms; and governments in North America, Latin America, Europe and the Far East. He began his career fifteen years ago as Principal Research Engineer in electronic imaging at Polaroid, developing high-resolution electronic imaging systems and conducting interdisciplinary work involving fiber optics, high-power laser diodes and control systems towards the development of desktop electronic imaging products. He has authored several papers and conference presentations, and was the panel chairman for the Optical Networking session at the Supercomm 2000 Conference. Dr. Yared is a member of the IEEE.

### ***Student Best Paper Award in Mechanical Engineering***

Carla Bahri, Marc Ghossoub, and Hiba Sheitly received the award for a paper entitled: A Molecular Dynamics Simulator for Solvated Proteins.



**Students receive Award Certificates**

### ***Best Poster Award***

The following students Abou Jaoude, Zeina (CEE), Bachir, Elias (ME), and Mourtada, Ali (CEE) received the Best Poster Award at the conference for their project entitled: Beirut Rafic Hariri International Airport Chartered Terminal.

### **UNDP and UNEP Best Article Award on Public Involvement in the Ozone Depletion Problem was won by Carla Bahri.**

On the occasion on the 20<sup>th</sup> anniversary of the Montreal Protocol for the protection of the ozone layer, the Ministry of Environment and the United Nations Development Programme (UNDP) in Lebanon in collaboration with the United Nations Environment Programme (UNEP) organized a contest for the best poster, magazine/newspaper article, and general audience paper. The theme was created to involve the general public the ozone depletion problem.

Carla Bahri, a fourth year student in mechanical engineering, after taking a course on environmental challenges in managing ozone depleting substances (MECH 518, offered by Prof. Moukalled) became interested in contributing to this awareness effort and in making AUB a part of it. She wrote an article entitled “Ozone Alert: Take Action,” which discussed the seriousness of the problem of ozone depletion and the necessary steps to create awareness.

Ms. Bahri was informed by the Lebanese Ministry of Environment on July 25, 2007 that she had won the Best Article Award from Lebanon. She is invited to Montreal-Canada to receive the award and to attend the Montreal Protocol 20th anniversary celebrations and meetings from September 15, 2007 through September 21, 2007.

## FEA and Graduate Awards

### ***Dean's Awards for Creative Achievement***

Mechanical engineering students: Maher Itani, Amer Keblawi, Ibrahim Manasfi, and Nibal Nehme received the Dean's Award for Creative Achievement for the academic year 2006-07. The award was granted for the Final Year Project entitled: Thermal and Flow Field in an Enclosure Cooled by Chilled Ceiling and Displacement Ventilation by Experimentation and Simulation. The project advisor was Prof. Nesreen Ghaddar.



**Students receive award certificates**

Two of mechanical engineering students, Nasser Ghoussuiny and Assad Tahhan were members of an ECEE FYP group with ECE students Claude Abou Daher and Ali Hinnawi. The group received the Dean's Award for Creative Achievement in Electrical Engineering for a project entitle: Design and Implementation of an Intelligent Car-Following Collision Prevention Controller. The project advisor was Prof. Saade from the Department of Electrical and Computer Engineering.



**Students receive award certificates**

### ***Distinguished Graduate Award***

**Mr. Mark Ghossoub** received the ME Distinguished Graduate Award. Mr. Ghossoub is the top ranked student in his class and has been on the Dean's Honor List since he joined AUB in 2003-04. He was a recipient of an AUB Merit Scholarship that continued through his four years of study. Marc provided voluntary tutoring to his peers in their

course projects related to instrumentation and control, and on use of the FLUENT CFD software. He represented his class at community meetings voicing shared issues and documenting possible solutions to improve learning in the department. He was also an active participant in the student professional societies.

#### ***Abdul Hadi Debs Endowment Award for Academic Excellence***



**Mr. Ihab Sraj**, a graduate student at the Department of Mechanical Engineering received the Abdul Hadi Debs Award. Mr. Ihab Sraj completed his thesis work under the supervision of Profs. Fadl Moukalled and Marwan Darwish. The award, in addition to excellence in academic performance, is based on peer-reviewed research work and publications.

#### ***Sakkal Renewable Energy Graduate Thesis Award***

**Mr. Mounir Mossolly**, a graduate student in the Department of Mechanical Engineering received this award of \$3,000 for demonstrating evidence of quality research work in the field of renewable energy and energy efficiency with special applications to Lebanon. Mr. Mossolly thesis advisor is Prof. Nesreen Ghaddar.



**Mossolly receives the award**

#### ***PETROFAC Graduate Fellowship***



**Mr. Amer Abdul-Aziz** was awarded the Petrofac Graduate Fellowship valued at \$12,500/year to cover tuition and stipend for his graduate education. Mr. Amer Abdel Aziz joined the graduate program in mechanical engineering at AUB in October 2006. He is expected to graduate in June 2008. Amer finished his high school education in July 2001 in "General Sciences" and was ranked first in the South Lebanon District on the official baccalaureat exam. He joined the Lebanese University in the Faculty of Engineering (Branch III), Department of Mechanical Engineering and was awarded the Diploma in Mechanical Engineering in August 2006 where he was ranked third in a class of sixty students.



## ME Student Papers Presented at the 6<sup>th</sup> Annual FEA Student Conference, May 23 – 24, 2007

1. Joe Rached, Nancy Daher, “Numerical Prediction of Slip Flow and Heat Transfer in Microchannels,” *Proceedings of the 6<sup>th</sup> Annual FEA Student Conference*, pages 109-14, May 23-24, 2007.
2. Carla Bahri, Marc Ghossoub, and Hiba Sheheitli , “A Molecular Dynamics Simulator for Solvated Proteins,” *Proceedings of the 6<sup>th</sup> Annual FEA Student Conference*, pages 115-20, May 23-24, 2007.
3. Ahmad Sinno, Hani Houwalla, and Mahmoud Madhoun, “Brake Pad Testing Machine,” *Proceedings of the 6<sup>th</sup> Annual FEA Student Conference*, pages 121-24, May 23-24, 2007.
4. Ola Knio, Roy Abou Tayeh, Elie Fares, and Jules Abou Abdallah, “Aerial Localization of Landmines Using Computer Vision,” *Proceedings of the 6<sup>th</sup> Annual FEA Student Conference*, pages 125-30, May 23-24, 2007.
5. Ali Sadek, Wael Abdel Samad, and Ali Nour Eddine. “South Renewable Energy Program (SREP),” *Proceedings of the 6<sup>th</sup> Annual FEA Student Conference*, pages 131-36, May 23-24, 2007.
6. Mounir Mosolly, “Experimental Investigation of the Near Field Wake of a NACA0012 Airfoil,” *Proceedings of the 6<sup>th</sup> Annual FEA Student Conference*, pages 279-84, May 23-24, 2007.
7. Amer Keblawi, Ibrahim Manasfi, Maher Itani, Nibal Nehme, “Thermal and Flow Field in an Enclosure Cooled by Chilled Ceiling and Displacement Ventilation by Experimentation and Simulation,” *Proceedings of the 6<sup>th</sup> Annual FEA Student Conference*, pages 285-91, May 23-24, 2007.
8. Peggy Abou Arraj, Amer Al Bukhari, Nizar Fakih, and Louis Darwiche, “Marine Propeller Cavitation,” *Proceedings of the 6<sup>th</sup> Annual FEA Student Conference*, pages 292-96, May 23-24, 2007.
9. Sherif Kassatly and Wassim Skaff, “Turbulent Natural Convection Heat Transfer in Channels with Convex Surfaces,” *Proceedings of the 6<sup>th</sup> Annual FEA Student Conference*, pages 297-301, May 23-24, 2007.
10. Ali Sadek, “Particle Image Velocimetry Analysis on a Jet in Cross Flow,” *Proceedings of the 6<sup>th</sup> Annual FEA Student Conference*, pages 306-12, May 23-24, 2007.

## **Events: Activities, Contests, Trips, Visits**

### **ASME Activities**

#### **New Student Orientation, October 2 – 6, 2006**

Members of the cabinet and other ME students assisted the Mechanical Engineering department in the New Students Orientation Program. A stand was set up at the main entrance of the Bechtel building, where brochures were distributed and advice was given to all new students. The orientation program also included a lecture session where basic registration procedure and study tips as well as other student concerns were addressed.

#### **Annual Iftar, October 18, 2006**

The annual iftar is one of the Faculty of Engineering and Architecture's yearly traditions whereby all societies collaborate to organize a social gathering that brings faculty, staff and students from all years and majors together. This year more than 150 members of the FEA community met at the Gefinor Rotana Hotel in Clemenceau to celebrate this blessed occasion.

#### **Run for Aids, December 1, 2006**

Run for Aids is a yearly awareness campaign organized by the Lebanese Red Cross Club at AUB. The event which was covered by many national media stations included a mini-marathon whereby a single student group was rewarded for their spirit. This year, the group prize went to the American Society of Mechanical Engineers (ASME) whose members marched excitedly around campus carrying awareness banners and shouting preventative slogans. The ASME would like to thank: Abdel Fatah Al Shafie, Mohammad Ammar Al Hajjar, Mohammad Bantan, Amin Kanafani, Wafaa Karaki, Bassel Mikati, Ahmad Sinno, and Dr. Issam Lakkis for their active participation in the event.

#### **Trip to AUB Power Plant, December 14, 2006**

The ASME organized a trip to the AUB power plant under the supervision of Dr. Alan Louis Shihadeh. During the visit, Dr. Shihadeh and plant technicians explained to the students how the machinery operated. Students found the visit very interesting because it related material seen in course lectures to real-life applications.

#### **Annual Christmas Dinner, December 22, 2006**

The Christmas dinner is also a yearly FEA tradition organized by many clubs and societies. This year, the dinner which had a "Cheese and Wine" theme was held at Schtroumph, Jounieh where the students enjoyed a delicious buffet and sang to the tunes of the karaoke machine.

#### **Micro Car Gee Wiz Contest, January 15, 2007**

The Micro Car Gee Wiz Contest is held for the "MECH 200: Mechanical Engineering Tools" course during which students build small cars from scratch and compete, at the end of the semester, in a multi-stage race. This year, the ASME took on the organization of the event which was held between the Main Gate and College Hall. Event t-shirts and refreshments were distributed to all the participants. The ASME would like to thank Ali Amouri and Ahmad Farshoukh for their help and support.

### **Bowling Tournament, February 22, 2007**

The bowling tournament took place in D-Link, Antelias. The event was an opportunity for professionals to compete and amateurs to be initiated into a new fun sport.

### **Clean Out Your Closet, March 27 – 29, 2007**

“Clean Out Your Closet” is a project carried out by the Lebanese Red Cross Club at AUB with the collaboration of the ASME. A stand was set-up at the Bechtel main entrance for students to donate used clothes. The clothes went to the social organization, Ajyalouna, that assists refugees of the July 2006 war.

### **Field Trip to Phoenix Machinery, April 26, 2007**

Phoenix Machinery is one of the most experienced and fastest growing manufacturers of industrial machines in the MENA region. Around thirty students from the class of 2009 visited the factory where they were taken through the production process, from the design to the manufacturing of new machinery and the recycling of old equipment.

### **Annual FEA BBQ, April 26, 2007**

FEA clubs and societies held the Annual Engineering Barbecue on the Engineering Terrace next to the Bechtel building. The event, which was funded by the Dean of FEA Ibrahim Hajj, brought together four hundred students, faculty and staff members who shared a pleasant meal and a few laughs. The organizers would like to thank Dean Hajj for his generous contribution, instructors Ahmad Farshoukh and Khaled Joujou for their invaluable support and everyone else who contributed to the event’s success.

ASME would like to thank all its members who took part in the various activities the cabinet organized throughout the year, especially those members who contributed to the success of these events. ASME would also like to thank the Mechanical Engineering Department for its on-going support and encouragement.

### **Photos from the Gee Wiz Contest of Spring 2007**

