FLORIDA ATLANTIC UNIVERSITY

Graduate Programs—PROGRAM CHANGE REQUEST

UGPC APPROVAL _____

UFS APPROVAL _____

CATALOG _____

DEPARTMENT: OCEAN AND MECHANICAL ENGINEERING

COLLEGE: ENGINEERING AND COMPUTER SCIENCE

PROGRAM NAME: MASTER'S DEGREE IN OCEAN AND MECHANICAL ENGINEERING

EFFECTIVE DATE
(PROVIDE TERM/YEAR)

FALL 2017

PLEASE EXPLAIN THE REQUESTED CHANGE(S) AND OFFER RATIONALE BELOW AND/OR ATTACHED:

THIS PROPOSAL ADDS TWO GRADUATE CLASSES. THESE HAVE BEEN APPROVED BY THE DEPARTMENT GRADUATE COMMITTEE.

Faculty contact, email and complete phone number:	Consult and list departments that might be affected by the change and attach comments.
Frederick Bloetscher, Ph.D., P.E. **239-250-2423**	**None – the change is only to this department based on classes offered**

Approved by:	*Date:*
Department Chair:	
College Curriculum Chair:	9/15/16
College Dean:	
UGPC Chair:	11-9-2016
Graduate College Dean:	11-14-16
UFS President:	
Provost:	

Email this form and syllabus to UGPC@fau.edu **one week before** the University Graduate Programs Committee meeting so that materials may be viewed on the UGPC website prior to the meeting.

Mechanical Engineering Graduate Courses

Controls

Optimal Control Systems (EEL 6672) 3 credits
Prerequisite: Permission of instructor
The optimization theory is applied to continuous and discrete dynamic systems.

Helicopter Dynamics

Helicopter Dynamics (EAS 6155) 3 credits
Prerequisite: Graduate standing
Helicopter configurations, actuator disc theory, ducted fans and actuator discs, blade element theory, autoration, axial flight and forward flight conditions, flapping dynamics, stability in axial and forward flights, multiblade coordinates and trimming.

Top

Manufacturing

Industrial Automation (EIN 5603C) 3 credits
Prerequisite: EML 4312 or its equivalent
Design of pneumatic and hydraulic systems for automation, use of programmable logic controller for combinational and sequential systems implementation, computerized numerical control machine tools and robotics, integration of manufacturing stations into a system.

Manufacturing Systems (EIN 6392) 3 credits
Concepts of manufacturing systems including their design and planning and the different functions of the organization.

Design of Experiments/Regression Analysis (ESI 6247) 3 credits
Statistical design and analysis of experiments and experimental models in engineering using regression and analysis of variance.

Materials

Mechanics of Composite Materials (EGM 6562) 3 credits
Prerequisite: Graduate standing
An introduction to composites, basic principles of elasticity, unidirectional composites, short-fiber composites, laminated composites, strength analysis, composite designs, joint criteria, and test methods.

Failure Prevention (EML 6233) 3 credits
Prerequisite: Graduate standing
Modes of mechanical failure, strength and deformation of metals, theories of failure, fatigue and fracture, life prediction, statistics, fretting, wear, and corrosion.

Mechanical Properties of Polymers (EML 6235) 3 credits
Prerequisite: EGN 3331 or equivalent with minimum grade of "C"
Review structure and processing of methods of engineering plastics; structure-property relationships, analysis of creep and stress relaxation; viscoelastic models; dynamic-mechanical response; rubber elasticity.

Fracture Mechanics (EML 6239) 3 credits
Prerequisite: Graduate standing
An introduction to linear elastic fracture mechanics. It studies deformation response of materials, toughness, fatigue and fracture, environmentally assisted cracking, experimental methods, and data reduction.

Top

Solid Body Mechanics

Molecular, Cellular, and Tissue Biomechanics (BME 6222) 3 credits
Introduction to biomechanical phenomena over a range of length scales from molecular to cellular to tissue levels.

Nanotechnology (BME 6572) 3 credits
An introduction to nanotechnology through lectures, demonstrations, and projects covering fundamental science behind nanotechnology; tools for nanosciences; smart materials; sensors; biomedical applications; energy capture, transformation, and storage; optics and electronics; fabrication and modeling; and the nano business, nano industry.

Fields, Forces, and Flows in Biological Systems (BME 6638) 3 credits
Introduction and analysis of transport phenomena in biological systems. Topics include: chemical subsystems-diffusion of non-electrolytes; electrical subsystems-electro-diffusion on ions; mechanical subsystems-fluid mechanics and convective transport; and electromechanical and physiochemical interactions.

Introduction to Finite Element Methods (EGM 5351) 3 credits
Prerequisites: Senior or graduate standing, MAD 3400 or equivalent
Application of finite element programs to problems in heat transfer, fluid mechanics, vibration, stress analysis and machine design.

Introduction to Elasticity (EGM 5653) 3 credits
Prerequisite: EGN 3331 or equivalent
Analysis of stress, strain, and deformation. Compatibility, equilibrium, and constitutive equations. Two-dimensional problems in rectangular and polar coordinates. Variational principles. Thermal issues.

Advanced Strength of Materials (EGM 6533) 3 credits
Prerequisite: Graduate standing
Elements of plane elasticity, failure theories, and advanced topics in bending and torsion of structural elements. It serves as an introduction to finite element methods and applications in machine design.

Theory of Elastic Stability (EGM 6736) 3 credits
Prerequisite: Graduate standing
Introducing the principles and theory of structural stability and the buckling characteristics of structures such as beams, columns, thin plates, etc., and postbuckling of structures.

Special Topics (EGN 5930) 1-4 credits
Prerequisite: Permission of instructor
Courses in specialized interdisciplinary areas of engineering. May be repeated for credit.

Mechanical Vibrations (EML 6223) 3 credits
Prerequisite: Graduate standing
Step and impulse loads, multiple degrees of freedom, influence coefficients, matrix methods, vibration of continuous systems, Lagrange's equations. This course serves as an introduction to non-linear and random vibrations.

Advanced Random Vibrations (EML 6229) 3 credits
Prerequisite: EML 6223 with minimum grade of "C"
Spectral analysis of linear discrete and continuous systems; theory of diffusive Markov process as applied to non-linear problems; stability and bifurcation of randomly excited systems; excursion and fatigue failures.

Advanced Engineering Dynamics (EML 6271) 3 credits
A course in three-dimensional kinematics and kinetics of particles and rigid bodies, Langrangian mechanics, Hamilton's principle, and engineering application to discrete and continuous systems.

Top

Thermal/Fluids

Conduction Heat Transfer (EML 6154) 3 credits
Prerequisite: Graduate standing
Steady state and transient conduction heat transfer in one- and multidimensional geometries. It emphasizes analytical methods, exact and approximate. Numerical techniques are also included.

Convection Heat Transfer (EML 6155) 3 credits
The solution of equations governing momentum and heat transfer. Applications include convective heat transfer for internal and external flows.

Turbomachinery (EML 6402) 3 credits
Prerequisite: Graduate standing
Performance characteristics of turbomachines, basic laws, the cascade theory, the thin airfoil theory, inviscid flow in three dimensions, boundary layers, axial flow turbines.

Solar Energy Engineering (EML 6417C) 3 credits
Prerequisite: Graduate standing
The fundamentals of solar radiation, transmission, and absorption; flat plate and focussing collectors, thermal storage, heating and cooling of structures, distillation, process heat generation, and power generation. Two hours lecture and six hours lab are required.

Computational Gas Dynamics (EML 6724) 3 credits
An introductory discussion of solving fluid dynamic problems through numerical computations. Gaseous medium includes compressible and incompressible fluid.

Advanced Computational Fluid Dynamics (EML 6726) 3 credits
Prerequisite: EML 3701 with minimum grade of "C"
Course is designed for advanced use and application of CFD for practical engineering flows. Topics covered include governing equations, numerical methods, geometry and mesh generation using Gambit, CFD package Fluent (solver), specific applications (turbulent flow, heat transfer, combustion), post processing, and validation of CFD data.

Experimental Fluid Mechanics and Heat Transfer (EML 6735C) 3 credits
Prerequisite: Graduate standing
Development of diverse topics of experimental research in fluid mechanics and heat transfer, discussion of tools needed in the description and analysis of experimental data, individual experimental methods such as hot wire anemometry, laser-Doppler anemometry etc., data acquisition techniques and computer data analysis, design of experimental apparatus utilizing the above techniques.

Advanced Fluid Dynamics (EML 6716) 3 credits
Prerequisite: *Graduate Standing, Undergraduate EML 3701 Fluid Mechanics or Permission of Instructor*
A survey of fluid dynamics addresses the fundamental principles and their applications in a variety of engineering and science problems. Topics covered include dimensional analysis, kinematics, dynamics, inviscid flow, viscous flow, vorticity, boundary layer, turbulence, compressible flow, flow with gravity, and flow of industrial and natural processes.

Wind Turbine Systems (EML 6456) 3 credits
Prerequisite: Graduate Standing or UG w/ EGN 3321 Dynamics, EML 3701 Fluid Mechanics & EGN 3321 Computer Application I or equivalent

A comprehensive introduction to wind turbine systems and practical means of extracting green energy. The course begins with a historical perspective and taxonomy such as horizontal axis and vertical axis wind turbines and the basic parameters such as power rating and efficiency, describes the structural components ranging from blade and hub to nacelle and tower. This is followed by a treatment of wind data analysis and turbulence, rotor aerodynamics, rotor and hub and tower dynamics, and wind turbine control, as well as economics and environmental aspects.

Special Topics, Thesis, and Dissertation

Directed Independent Study (EML 6905) 1-3 credits
Prerequisite: Permission of instructor
Study of advanced topics related to special needs and interests of the individual student. May be taken for repeated credit.

Special Topics (EML 6930) 1-3 credits
Prerequisite: Graduate standing
A course in specialized area not adequately covered in other courses. It may be repeated for credit.

Master's Thesis - Mechanical Engineering (EML 6971) 1-9 credits
Grading: S/U

Dissertation-Mechanical Engineering (EML 7980) 1-15 credits
Grading: S/U

COMBINED PROGRAMS

B.S.M.E. to M.S. Degree Program (Thesis Option) (Changes effective fall 2016.)

Candidates seeking a combined program leading to both Bachelor of Science in Mechanical Engineering and Master of Science degrees with the thesis option must complete an approved program of at least 30 credits. Out of those 30, 9 credits of graduate coursework (5000 level or higher) will count toward both the bachelor's and master's degrees, as long as the following criteria are met:

1. The student has met the minimum 120 credits for the bachelor's degree; and

2. The student has taken a minimum of 30 credits in 5000 level or higher courses for the master's program.

A maximum of 9 credits may then be counted for both the bachelor's and master's programs if the total number of credits exceeds 150.

Prerequisite Coursework for Transfer Students
Students transferring to Florida Atlantic University must complete both lower-division requirements (including the requirements of the Intellectual Foundations Program) and requirements for the college and major. Lower-division requirements may be completed through the A.A. degree from any Florida public college, university or community college or through equivalent coursework at another regionally accredited institution. Before transferring and to ensure timely progress toward the baccalaureate degree, students must also complete the prerequisite courses for their major as outlined in the *Transfer Student Manual*.

All courses not approved by the Florida Statewide Course Numbering System that will be used to satisfy requirements will be evaluated individually on the basis of content and will require a catalog course description and a copy of the syllabus for assessment.

Degree Requirements
Candidates must complete the following:

1.Three core courses (9 credits): EGM 6533, Advanced Strength of Materials; EML 6223, Mechanical Vibrations or EML 6930, Special Topics (Control); and EML 6716, Fluid Dynamics;

2. A math course (3 credits): ~~either MAP 4306, Engineering Mathematics 2, or~~ EOC 5172, Mathematical Methods in Ocean Engineering 1;

3. Four technical electives (12 credits) ~~Two courses may be~~ at the 5000 ~~4000~~ level or higher;

4. Up to three courses may be taken while the student is an undergraduate;

5. Before the end of the student's third semester of full-time enrollment, a written thesis proposal must be submitted to the supervisory committee and defended in an oral examination;

6. A master's thesis (6 credits), which must be defended at an oral examination;

7. At least one-half of the credits must be at the 6000 level or above;

8. At least one-half of the credits must be from the list of Mechanical Engineering courses shown in the Engineering and Computer Science Course Descriptions section.

Top

B.S.M.E. to M.S. Degree Program (Non-Thesis Option) (Changes effective fall 2016.)

Candidates seeking a combined program leading to both Bachelor of Science in Mechanical Engineering and Master of Science degrees with the non-thesis option must complete an approved program of at least 33 credits. Out of those 33, 9 credits of coursework (3 credits at the 4000 level and 6 credits at the 5000 level or higher) will count

toward both the bachelor's and master's degrees.

Prerequisite Coursework for Transfer Students
Students transferring to Florida Atlantic University must complete both lower-division requirements (including the requirements of the Intellectual Foundations Program) and requirements for the college and major. Lower-division requirements may be completed through the A.A. degree from any Florida public college, university or community college or through equivalent coursework at another regionally accredited institution. Before transferring and to ensure timely progress toward the baccalaureate degree, students must also complete the prerequisite courses for their major as outlined in the *Transfer Student Manual*.

All courses not approved by the Florida Statewide Course Numbering System that will be used to satisfy requirements will be evaluated individually on the basis of content and will require a catalog course description and a copy of the syllabus for assessment.

Degree Requirements
Candidates must complete the following:

1. Three core courses (9 credits): EGM 6533, Advanced Strength of Materials; EML 6223, Mechanical Vibrations or EML 6930, Special Topics (Control), and EML 6716, Fluid Dynamics;

2. A math course (3 credits): ~~either MAP 4306, Engineering Mathematics 2, or~~ EOC 5172, Mathematical Methods in Ocean Engineering 1;

3. Seven technical electives (21 credits). One ~~Two~~ courses may be at the 4000 level;

4. Up to three courses, one at the 4000 level and two at the 5000 level or higher, may be taken while the student is an undergraduate;

5. At the time of application for degree, students must submit a portfolio to their advisor consisting of four graduate projects from 11 courses in their program of study. The portfolio will be reviewed by the student's supervisory committee;

6. At least one-half of the credits must be at the 6000 level or above;

7. At least one-half of the credits must be from the list of Mechanical Engineering courses shown in the Engineering and Computer Science Course Descriptions section.

B.S.M.E. to M.S. Degree Program (Non-Thesis Option/Business Minor)

Candidates seeking a combined program leading to both Bachelor of Science in Mechanical Engineering and Master of Science degrees with the non-thesis option and with a minor in Business must complete an approved program of at least 36 credits. Out of those 36, 9 credits of coursework (3 credits at the 4000 level and 6 credits at the 5000 level or higher) will count toward both the bachelor's and master's degrees.

Prerequisite Coursework for Transfer Students
Students transferring to Florida Atlantic University must complete both lower-division requirements (including the requirements of the Intellectual Foundations Program) and requirements for the college and major. Lower-division requirements may be completed through the A.A. degree from any Florida public college, university or community college or through equivalent coursework at another regionally accredited institution. Before transferring and to ensure timely progress toward the baccalaureate degree, students must also complete the prerequisite courses for their major as outlined in the *Transfer Student Manual*.

All courses not approved by the Florida Statewide Course Numbering System that will be used to satisfy requirements will be evaluated individually on the basis of content and will require a catalog course description and a copy of the syllabus for assessment.

Degree Requirements
Candidates must complete the following:

1. Three core courses (9 credits): EGM 6533, Advanced Strength of Materials; EML 6223, Mechanical Vibrations or EML 6930, Special Topics (Control); and EML 6930, Special Topics (Fluid Dynamics);

2. A math course (3 credits): ~~either MAP 4306, Engineering Mathematics 2, or EOC 5172~~, Mathematical Methods in Ocean Engineering 1;

3. Three technical electives (9 credits), one at the 4000 level and two at the 5000 or 6000 level from the list of Mechanical Engineering courses shown in the Engineering and Computer Science Course Descriptions section;

4. Up to three courses, one at the 4000 level and two at the 5000 level or higher, may be taken while the student is an undergraduate;

5. Five business courses (15 credits) as described at the beginning of this College of Engineering and Computer Science section;

6. At the time of application for degree, students must submit a portfolio to their advisor consisting of four graduate projects from 12 courses in their program of study. The portfolio will be reviewed by the student's supervisory committee;

7. At least one-half of the credits must be at the 6000 level or above;

8. At least one-half of the credits must be from the list of Mechanical Engineering courses shown in the Engineering and Computer Science Course Descriptions section.

Top

MASTER'S PROGRAMS

The Master of Science program has both thesis and non-thesis options. The thesis option requires a minimum of 24 credits of coursework and a thesis (6 additional credits). The non-thesis option requires a minimum of 33 credits of coursework. Requirements for the Ph.D. program are described later in this section.

Each student must complete a comprehensive and coordinated Plan of Study requiring depth in one or more of the following areas: mechanical systems, solid body mechanics, fluid mechanics, heat transfer, thermal/fluid systems, helicopter dynamics, materials, manufacturing, controls, robotics and CAD/CAM.

Admission Requirements
Usual admission requirements are as follows. Students with non-engineering bachelor's degrees, click here for additional requirements.

1. A baccalaureate degree in Engineering, Natural Science or Mathematics, but preferably in Mechanical Engineering and from a regionally accredited institution. A student who does not have a background in mechanical engineering should expect to take additional undergraduate mechanical engineering coursework.

2. Demonstrated proficiency in both written and spoken English. A student from a non-English-speaking country is required to take the Test of English as a Foreign Language (TOEFL) exam and achieve a score of at least 550 (CBT-213, iBT-79).

3. At least a 3.0 (of a 4.0 maximum) GPA in the last 60 credits attempted prior to graduation.

4. A score of 145 or higher on the verbal and 150 or higher on the quantitative portions of the Graduate Record Examination (GRE) or a combined score of 1000 or higher on the verbal and quantitative portions of the GRE taken prior to fall 2011. GRE scores more than five years old will not be accepted.

5. Petitions for admittance to the program will not be accepted when a student wishes to include more than five courses taken as a non-degree-seeking student.

Admission to Candidacy
A student is eligible to apply for candidacy when:

1. The student has completed a minimum of 9 credits as a graduate student.

2. The student has maintained a minimum GPA of 3.0 in all courses attempted as a graduate student.

3. The student has filed an approved Plan of Study for the degree program.

Students should file for candidacy as soon as they are eligible. Usually, no more than 20 credits of completed work before admission to candidacy will be accepted toward a degree program. A student should be admitted to candidacy prior to beginning work on thesis.

Degree Requirements
Students must satisfy all of the University graduate requirements.

Link to Master of Science with Major in Mechanical Engineering

Non-thesis Option and Non-thesis Option with a Business Minor

Link to Master of Science with Major in Mechanical Engineering and Engineering Management Minor

Top

Master of Science with Major in Mechanical Engineering (Thesis Option) (Changes effective fall 2016.)

Candidates for the Master of Science degree with the thesis option must complete an approved program of at least 30 credits including:

1. Three core courses (9 credits): EGM 6533, Advanced Strength of Materials; EML 6223, Mechanical Vibrations or EML 6930, Special Topics (Control); and EML 6716, Fluid Dynamics;

2. A math course (3 credits): ~~either MAP 4306, Engineering Mathematics 2, or~~ EOC 5172, Mathematical Methods in Ocean Engineering 1;

3. Four technical electives (12 credits) at the 5000 level or higher; ~~two courses may be at the 4000 level;~~

4. Before the end of the student's third semester of full-time enrollment, a written thesis proposal must be submitted to the supervisory committee and defended in an oral examination;

5. A Master's thesis (6 credits), which must be defended at an oral examination;

6. At least one-half of the credits must be at the 6000 level or above;

7. At least one-half of the credits must be from the list of Mechanical Engineering courses shown in the Engineering and Computer Science Course Descriptions section.

Master of Science with Major in Mechanical Engineering
Non-Thesis Option and Non-Thesis Option with a Business Minor (Changes effective fall 2016.)

Candidates for the Master of Science degree with the non-thesis option must complete an approved program of at least 33 credits including:

1. Three core courses (9 credits): EGM 6533, Advanced Strength of Materials; EML 6223, Mechanical Vibrations or EML 6930, Special Topics (Control); and EML 6716, Fluid Dynamics;

2. A math course (3 credits): ~~either MAP 4306, Engineering Mathematics 2, or~~ EOC 5172, Mathematical Methods in Ocean Engineering 1;

3. Seven technical electives (21 credits); one ~~two~~ courses may be at the 4000 level or higher with the additional courses at the 5000 or 6000 level;

4. At the time of application for degree, students must submit a portfolio to their advisor consisting of four graduate projects from 11 courses in their program of study. The portfolio will be reviewed by the student's supervisory

committee;

5. At least one-half of the credits must be at the 6000 level or above;

6. At least one-half of the credits must be from the list of Mechanical Engineering courses shown in the Engineering and Computer Science Course Descriptions section.

Candidates for the Master of Science degree with the non-thesis option and a Business minor must complete an approved program of at least 36 credits including:

1. Three core courses (9 credits): EGM 6533, Advanced Strength of Materials; EML 6223, Mechanical Vibrations or EML 6930, Special Topics (Control); and EML 6716, Fluid Dynamics ;

2. A math course (3 credits): ~~either MAP 4306, Engineering Mathematics 2, or~~ EOC 5172, Mathematical Methods in Ocean Engineering 1;

3. Three technical elective courses (9 credits) at the 5000 or 6000 level from the list of Mechanical Engineering courses shown in the Engineering and Computer Science Course Descriptions section; one course may be at the 4000 level;

4. Five business courses (15 credits) as described at the beginning of this College of Engineering and Computer Science section under the Business Minor heading;

5. At the time of application for degree, students must submit a portfolio to their advisor consisting of four graduate projects from 12 courses in their program of study. The portfolio will be reviewed by the student's supervisory committee;

6. At least one-half of the credits must be at the 6000 level or above;

7. At least one-half of the credits must be from the list of Mechanical Engineering courses shown in the Engineering and Computer Science Course Descriptions section.

Top

Master of Science with Major in Mechanical Engineering and Engineering Management Minor (Changes effective fall 2016.)

This Master of Science degree program with a minor in Engineering Management is a 36-credit program consisting of advanced courses in mechanical engineering as well as courses in the College of Business. Candidates for this program should have an undergraduate degree in mechanical engineering with a minimum GPA of 3.0 and a score of 145 or higher on the verbal and 150 or higher on the quantitative portions of the Graduate Record Examination (GRE), or a combined score of 1000 or higher on the verbal and quantitative portions of the GRE taken prior to fall 2011. GRE scores more than five years old will not be accepted. Non-English-speaking candidates must have a minimum score of 550 on the TOFEL. Two reference letters and at least two years of professional experience are also required.

Candidates for the Master of Science degree with Major in Mechanical Engineering and Engineering Management minor must complete an approved program of at least 36 credits including:

1. Three core courses (9 credits): EGM 6533, Advanced Strength of Materials; EML 6223, Mechanical Vibrations or EML 6930, Special Topics (Control); and EML 6716, Fluid Dynamics;

2. A math course (3 credits): ~~either MAP 4306, Engineering Mathematics 2, or~~ EOC 5172, Mathematical Methods in Ocean Engineering 1;

3. Three elective courses (9 credits) from the list of Mechanical Engineering courses shown in the Engineering and Computer Science Course Descriptions section. One may be at the 4000 level;

4. Three required management courses (9 credits) listed in the table below;

5. Two management elective courses (6 credits) from the table below;

6. At the time of application for degree, students must submit a portfolio to their advisor consisting of four graduate projects from 12 courses in their program of study. The portfolio will be reviewed by the student's supervisory committee;

7. At least one-half of the credits must be at the 6000 level or above;

8. At least one-half of the credits must be from the list of Mechanical Engineering courses shown in the Engineering and Computer Science Course Descriptions section. Only one 4000-level course may be taken from the list of courses below.

Required Management Courses (9 credits)		
Organizational Behavior	MAN 6245	3
Operations Management	MAN 6501	3
Project Management	MAN 6526	3

Management Elective Courses (6 credits)		
Select two courses from the list:		
Business Law for Honors Students	BUL 4424	3
Labor Relations	MAN 4401	3
Introduction to Small Business – Entrepreneurship	MAN 4802	3
Entrepreneurship, Creativity and Innovation	MAN 6299	3
Project Management	MAN 6526	3
Cross-Cultural Management and Human Resources	MAN 6609	3
International Business Operations	MAN 6614	3
Entrepreneurial Consulting Project	MAN 6806	1-4
Seminar in Entrepreneurship/Venture Management	MAN 6875	3
Global Environment of Management	MAN 6937	3

Top

DOCTORAL PROGRAM

Doctor of Philosophy with Major in Mechanical Engineering

The degree of Doctor of Philosophy with major in Mechanical Engineering is conferred by the University primarily in recognition of a demonstrated ability for independent and original research in the discipline. This ability must be supported by a comprehensive and coordinated plan of advanced study designed to provide a strong background in the fundamentals of mechanical engineering and related areas.

Admission Requirements
Minimum requirements for admission to doctoral studies in mechanical engineering are as follows:

1. A baccalaureate in engineering or a related field from a recognized institution;

2. An average of "B" or better in the last 60 credits of work attempted;

3. A score of 145 or higher on the verbal and 150 or higher on the quantitative portions of the Graduate Record Examination (GRE) or a combined score of 1000 or higher on the verbal and quantitative portions of the GRE taken

prior to fall 2011. GRE scores more than five years old will not be accepted;

4. Demonstrated proficiency in both written and spoken English. A student from a non-English-speaking country is required to take the test of English as a Foreign Language (TOEFL) and achieve a score of at least 550 (CBT-213, iBT-79);

5. Three letters of reference attesting to the student's potential for graduate studies in mechanical engineering;

6. Approval for admission by the Department of Ocean and Mechanical Engineering. Usually, an applicant admitted will have a strong record of achievement that exceeds the minimum requirements. It is anticipated almost every applicant will already have a master's degree, but it is not an absolute requirement. Approval for admission by the department will be based on an evaluation of the student's record in terms of likelihood of success in the Ph.D. program.

Admission to doctoral studies does not constitute admission to candidacy for the degree.

Admission to Doctoral Status
Admission to doctoral status is granted after students have:

1. Successfully completed General Examination 1;

2. Been accepted by a department faculty member willing to serve as their dissertation advisor;

3. Had their plan of coursework approved by their advisor, by the department graduate coordinator and by the Graduate College.

Admission to Candidacy
Admission to candidacy requires formulation of a supervisory committee approved by the department graduate coordinator as well as successful completion of General Examination 1.

Degree Requirements
A central requirement for the Ph.D. degree in Mechanical Engineering is submission and defense of a dissertation based upon original research in an area of focus acceptable to the student's supervisory committee. The completed dissertation must be approved by the committee, the department chair and the Graduate College. Additional requirements are:

1. A minimum of 51 credits of coursework beyond the baccalaureate degree, or 21 credits beyond the master of science degree;

2. No more than 3 credits of directed independent study may be used to satisfy the minimum 21 credits of coursework;

3. A minimum of 12 credits must be in Mechanical Engineering courses, including three core courses: EGM 6533, Advanced Strength of Materials; EML 6223, Mechanical Vibrations or EML 6930, Special Topics (Control); and EML 6716, Fluid Dynamics;

4. Doctoral thesis research of not less than 33 credits;

5. Successful completion of General Examination 1;

6. Successful completion of General Examination 2;

7. Submitted and defended a dissertation based on original research in the student's area of specialization. The supervisory committee, the department chair and the Graduate College must have approved the dissertation;

8. Satisfaction of all University regulations and requirements for the Ph.D. degree;

9. **General Examination 1:** After the completion of three Mechanical Engineering core courses and two elective courses, the student will be required to take a General Examination 1, or Ph.D. Qualifying Exam. The primary purpose of General Examination 1 is to evaluate the student's ability, not only to demonstrate a thorough knowledge

of Mechanical Engineering course material, but to evaluate original thinking. The written examination will be in four parts: One covering the core courses, one covering elective subjects, one covering Mathematics and one is a review and analysis of a research paper. The exam on the three core courses will be three hours in duration and will require three problems to be answered. The electives exam will be a two-hour exam and will require one problem from two elective courses to be answered. The exam on Engineering Mathematics will be a two-hour exam and the student must answer two problems. The research paper exam will be a two-day take home exam requiring the student to answer questions on a specific research paper. A new set of examinations will be prepared and questions and problems from previous examinations are not available to students. It is expected that the examination on the elective courses will focus on the student's area of specialization;

An overall grade of 70 percent on the written examination is passing. Students who score below 70 percent are given the option of re-taking exams on topic areas in which they scored less than 70 percent before the beginning of the next semester. The student must score 70 percent in each subject that is retaken. Alternatively the student may retake the entire exam when it is next offered. There would only be one opportunity to retake all or part of the exam. General Examination 1 is scheduled early in the fall semester and in the spring semester each year;

10. For students who have obtained the M.S. in Mechanical Engineering at FAU, General Examination 1 must be taken no later than the beginning of the third semester of Ph.D. study or at the first opportunity it is offered thereafter. Those admitted to the Ph.D. program directly after the B.S. degree may take the examination after completing 24 credits of graduate coursework. For students not so previously enrolled, the exam must be taken by the beginning of the fourth semester or as soon as it is offered thereafter;

11. **General Examination 2:** At an appropriate point in the student's graduate studies, normally within 12 months of passing General Exam 1, the student must complete General Examination 2. This is the dissertation proposal defense, in which students defend the choice of a dissertation topic and answer a series of questions on fundamental issues related to their research topic. Students must have passed General Examination 1, selected the dissertation topic, formed a supervisory committee and completed a literature survey prior to the dissertation proposal defense;

In General Examination 2, students should be prepared to demonstrate the ability to perform research on a topic approved by the supervisory committee by presenting a comprehensive literature survey combined with a critical analysis of the state of the art in the particular field. While this examination will be centered around the particular research area, it will not necessarily be limited to that subject. If unsuccessful in the examination, the student may, at the discretion of the department, either remain in the doctoral program and retake the examination at a later date or withdraw from the program. No more than two attempts will be permitted.

Transfer Credits
A maximum of 6 credits beyond the master's degree can be transferred into the student's program of study.

Time Limits
No credit that is more than 10 years old at the time a graduate degree is awarded may be counted toward that degree at Florida Atlantic University. In addition, the final examination must be completed within five calendar years of the admission to candidacy, otherwise the Qualifying Examination must be repeated.

Residency Requirement
Students are required to spend two semesters of full-time study beyond the master's degree in residence at Florida Atlantic University.

Top