School of Engineering

& Applied Sciences

Bachelor of Mechanical Engineering

Mechanical Engineering (MENG) Curriculum

University General Education Requirements		
Course #	Course Name	#hrs
ENGL 100	Intensive English	0
ENGL 101	English 101	3
ENGL 102	English 102	3
ENGL 201	Writing Skills	3
ENGL 202	Communication & Presentation Skills	3
Total Number of Credits		12

Course #	Course Name	#hrs
CSCE 101	Computer & Information Skills	3
MATH 111	Analytical Geometry & Calculus I	4
MATH 201	Introduction to Probability & Statistics	3
HUMA 101	Introduction to Logic, Critical Thinking	2
HUMA 102	Introduction to Ethics	1
Total Number of Credits		13

Course #	Course Name	#hrs
NSCI 102	Selected Topics in Natural Sciences	3
SSCI 103	Selected Topics in Social Sciences	3
HUMA 103	Selected Topics in Humanities & Arts	3
NSCI, SSCI, or HUMA***	An elective course in one of the three categories	3
SSCI 101	Selected Topics in Egyptian & Arab Heritage	3
SSCI 102	Selected Topics in World Cultures & Diversity	3
COMM 401	Internship & Service Learning	3
Total Number of Credits		21

Total Number of Credits for University General Education Requirements	**46**

Engineering Core Requirements

	Course #	Course Name	#hrs
Introduction to Engineering	ENGR 101	Introduction to Engineering Disciplines	3
	ENGR 102	Engineering Design	3
Mathematics	MATH 112	Calculus II	4
	MATH 203	Differential Equations	4
	MATH 301	Linear Algebra	4
	MATH 303	Numerical Methods for Engineers	3
Physics	PHYS 101	Physics I (including lab)	4
	PHYS 201	Physics II (including lab)	4
Electrical & Computer Engineering	ECEN 101	Electric Circuits	3
Computer Science	CSCE 201	Introduction to Programming	3
Mechanics	MENG 101	Engineering Mechanics	3
Chemistry	CHEM 101	Chemical Principles	3
Industrial Engineering	ENGR 201	Solid Modeling & Workshop	3
	IENG 302	Safety Engineering	3
	IENG 301	Engineering Economics	3
Capstone Project	ENGR 540	Graduation Project I	3
	ENGR 541	Graduation Project II	3
Total Number of Credits for Engineering Education Requirements			56

MENG Breadth Requirements (15 courses = 40 credits)

Course #	Course Name	#hrs
MENG201	Introduction to Solid Mechanics and Strength of Materials	3
MENG202/IENG202	Manufacturing Technology	3
MENG301	Mechanical Behavior of Materials	2
MENG302	Mechanics II (Rigid Body Dynamics)	3
MENG303	Introduction to Engineering Materials	2
MENG304	Mechanical Measurements	2
MENG305	Machine Design	3
MENG307	Thermodynamics I	3
MENG308	Fluid Mechanics I	3
MENG309	Heat Transfer I	3
MENG311	Kinematics and Dynamics of Mechanical Systems	3
MENG312	Modeling and Simulation of Dynamic Systems	3
MENG401	Introduction to Finite Elements in Mechanical Engineering	2
MENG405	Electronics, Instrumentation and Power Circuits	2
MENG501	Practical Training	3
Total Number of Credits for MENG Breadth Requirements		**40**

Mechatronics Track (Track # 1)

Major Requirements (8 Courses = 24 credits)

Course #	Course Name	#hr
MENG410	Mechanical Vibrations	3
MENG414	Automatic Control	3
MENG416	Fundamentals of Mechatronics Engineering	3
MENG418	Pneumatics and Hydraulics Control Systems	3
MENG510	Digital and Industrial Control Systems	3
MENG512	Signal Processing	3
MENG514	Microprocessors and Microcontrollers	3
MENG515	Robotics	3

Major Breadth Electives: (2 Courses = 6 credits) courses from the following:

Course #	Course Name	#hrs
MENG516	Advanced Mechatronics – Integrated Design of Electromechanical Systems	3
MENG517	MEMS Devices and Systems	3
MENG518	Computer Control of Manufacturing Processes	3
MENG519	Modern Control Theory	3
MENG530/IENG303	Operations Research	3
MENG531/IENG401	Project Management	3

University General Education Requirements	46
Engineering Education Requirements	56
MENG Breadth Requirements	40
Major/Track Requirements	24
Total Number of Track Elective Credits	6
Total Number of Credits for B. Sc. in MENG	**172**

Thermal Science and Energy Track (Track #2)

Major Requirements (8 Courses = 24 credits)

Course #	Course Name	#hrs
MENG420	Thermodynamics II	3
MENG421	Heat Transfer II	3
MENG422	Fluid Mechanics II	3
MENG423	Combustion	3
MENG424	Internal Combustion Engines	3
MENG520	Turbo Machinery	3
MENG521	Refrigeration and Cryogenics	3
MENG522	Computational thermo-fluid mechanics	3

Major Breadth Electives: (2 Courses = 6 credits) courses from the following:

Course #	Course Name	#hrs
MENG523	Multiphase Flow	3
MENG524	Energy Conversion Systems	3
MENG525	Design and Optimization of Energy Systems	3
MENG526	Introduction to Renewable Energy	3
MENG527	Renewable Energy Systems Engineering	3
MENG530/IENG303	Operations Research	3
MENG531/IENG401	Project Management	3

University General Education Requirements	46
Engineering Education Requirements	56
MENG Breadth Requirements	40
Major/Track Requirements	24
Total Number of Track Elective Credits	6
Total Number of Credits for B. Sc. in MENG	**172**

Mechanical Engineering

Track 1: Mechatronics – Course Dependency

Mechanical Engineering

Track 2: Thermal Science and Energy – Course Dependency

Mechanical Engineering - Sample 5 Year Study Plan

Track 1: Mechatronics

Year 1					
Semester 1			**Semester 2**		
CODE	***COURSE TITLE***	***C.H.***	***CODE***	***COURSE TITLE***	***C.H.***
MATH 111	Analytical Geometry and Calculus I	4	ENGL 201	Writing Skills	3
ENGR 101	Introduction to Engineering Disciplines	3	MATH 112	Calculus II	4
CSCE 101	Computer & Information Skills	3	ENGR 102	Engineering Design	3
CHEM 101	Chemical Principles	3	PHYS 101	Physics I	4
HUMA 101	Introduction to Logic and Critical Thinking	2	HUMA 102	Introduction to Ethics	1
ENGL 101	English I	3	ENGL 102	English II	3
	TOTAL CREDIT HOURS	**18**		***TOTAL CREDIT HOURS***	**18**

Year 2					
Semester 3			**Semester 4**		
CODE	***COURSE TITLE***	***C.H.***	***CODE***	***COURSE TITLE***	***C.H.***
PHYS 201	Physics II	4	MENG 201	Introduction to Solid Mechanics and Strength of Materials	3
ECEN 101	Electric Circuits	3	MENG202/ IENG202	Manufacturing Technology	3
MATH 201	Introduction to Probability and Statistics	3	MENG 308	Fluid Mechanics I	3
ENGR 201	Solid Modeling and Workshop	3	CSCE 201	Introduction to Programming	3
MENG 101	Engineering Mechanics	3	MATH 203	Differential Equations	4
MENG 307	Thermodynamics I	3	ENGL 202	Communication and Presentation Skills	3
	TOTAL CREDIT HOURS	**19**		***TOTAL CREDIT HOURS***	**19**

Year 3					
Semester 5			Semester 6		
CODE	***COURSE TITLE***	***C.H.***	***CODE***	***COURSE TITLE***	***C.H.***
MATH 301	Linear Algebra	4	IENG 302	Safety Engineering	3
MATH 303	Numerical Methods for Engineers	3	MENG 301	Mechanical Behavior of Materials	2
MENG 302	Mechanics II	3	SSCI 101	Selected Topics in Egyptian & Arab Heritage	3
MENG 303	Introduction to Engineering Materials	2	MENG 305	Machine Design	3
MENG 304	Mechanical Measurements	2	MENG 309	Heat Transfer I	3
MENG 311	Kinematics and Dynamics of Mechanical Systems	3	MENG 312	Modeling and Simulation of Dynamic Systems	3
	TOTAL CREDIT HOURS	**17**		***TOTAL CREDIT HOURS***	**17**

Year 4					
Semester 7			Semester 8		
CODE	***COURSE TITLE***	***C.H.***	***CODE***	***COURSE TITLE***	***C.H.***
COMM 401	Internship and Service Learning	3	MENG 414	Automatic Control	3
MENG 401	Introduction to Finite Elements in Mechanical Engineering	2	IENG 301	Engineering Economy	3
NSCI 102	Selected Topics in Natural Sciences	3	MENG 416	Fundamentals of Mechatronics Engineering	3
NSCI *, SSCI *** or HUMA *****	General Knowledge Elective	3	MENG 418	Pneumatics and Hydraulics Control Systems	3
MENG 410	Mechanical Vibrations	3	SSCI 102	Selected Topics in World Cultures and Diversity	3
MENG 405	Electronics, Instrumentation and Power Circuits	2			
	TOTAL CREDIT HOURS	**16**		***TOTAL CREDIT HOURS***	**15**

**All MATH, PHYS, CSCE, CHEM, MENG and ECEN courses include 2 hours tutorial/lab per week.*

Year 5					
Semester 9			**Semester 10**		
CODE	***COURSE TITLE***	***C.H.***	***CODE***	***COURSE TITLE***	***C.H.***
MENG 501	Practical Training	3	SSCI 103	Selected Topics in Social Sciences	3
MENG 510	Digital and Industrial Control Systems	3	MENG 515	Robotics	3
MENG 512	Signal Processing	3	MENG XXX	Track 1 Elective	3
HUMA 103	Selected Topics in Humanities and Arts	3	MENG XXX	Track 1 Elective	3
MENG 514	Microprocessors and Microcontrollers	3	ENGR 541	Graduation Project II	3
ENGR 540	Graduation Project I	3			
	TOTAL CREDIT HOURS	**18**		***TOTAL CREDIT HOURS***	**15**

**All MATH, PHYS, CSCE, CHEM, MENG and ECEN courses include 2 hours tutorial/lab per week.*

General Knowledge Electives		
CODE	***COURSE TITLE***	***C.H.***
NSCI 102	Selected Topics in Natural Sciences	3
SSCI 103	Selected Topics in Social Sciences	3
HUMA 103	Selected Topics in Humanities and Arts	3

Track 1 Electives		
CODE	***COURSE TITLE***	***C.H.***
MENG516	Advanced Mechatronics – Integrated Design of Electromechanical Systems	3
MENG517	MEMS Devices and Systems	3
MENG518	Computer Control of Manufacturing Processes	3
MENG519	Modern Control Theory	3
MENG530/IENG303	Operations Research	3
MENG531/IENG401	Project Management	3

Mechanical Engineering - Sample 5 Year Study Plan
Track 2: Thermal Sciences and Energy

Year 1					
Semester 1			**Semester 2**		
CODE	***COURSE TITLE***	***C.H.***	***CODE***	***COURSE TITLE***	***C.H.***
MATH 111	Analytical Geometry and Calculus I	4	ENGL 201	Writing Skills	3
ENGR 101	Introduction to Engineering Disciplines	3	MATH 112	Calculus II	4
CSCE 101	Computer & Information Skills	3	ENGR 102	Engineering Design	3
CHEM 101	Chemical Principles	3	PHYS 101	Physics I	4
HUMA 101	Introduction to Logic and Critical Thinking	2	HUMA 102	Introduction to Ethics	1
ENGL 101	English I	3	ENGL 102	English II	3
	TOTAL CREDIT HOURS	**18**		***TOTAL CREDIT HOURS***	**18**

Year 2					
Semester 3			**Semester 4**		
CODE	***COURSE TITLE***	***C.H.***	***CODE***	***COURSE TITLE***	***C.H.***
PHYS 201	Physics II	4	MENG 201	Introduction to Solid Mechanics and Strength of Materials	3
ECEN 101	Electric Circuits	3	MENG202/ IENG 202	Manufacturing Technology	3
MATH 201	Introduction to Probability and Statistics	3	MENG 308	Fluid Mechanics I	3
ENGR 201	Solid Modeling and Workshop	3	CSCE 201	Introduction to Programming	3
MENG 101	Engineering Mechanics	3	MATH 203	Differential Equations	4
MENG 307	Thermodynamics I	3	ENGL 202	Communication and Presentation Skills	3
	TOTAL CREDIT HOURS	**19**		***TOTAL CREDIT HOURS***	**19**

Year 3					
Semester 5			Semester 6		
CODE	***COURSE TITLE***	***C.H.***	***CODE***	***COURSE TITLE***	***C.H.***
MATH 301	Linear Algebra	4	IENG 302	Safety Engineering	3
MATH 303	Numerical Methods for Engineers	3	MENG 305	Machine Design	3
MENG 302	Mechanics II	3	MENG 301	Mechanical Behavior of Materials	2
MENG 303	Introduction to Engineering Materials	2	SSCI 101	Selected Topics in Egyptian & Arab Heritage	3
MENG 304	Mechanical Measurements	2	MENG 309	Heat Transfer I	3
MENG 311	Kinematics and Dynamics of Mechanical Systems	3	MENG 312	Modeling and Simulation of Dynamic Systems	3
	TOTAL CREDIT HOURS	**17**			**17**

Year 4					
Semester 7			Semester 8		
CODE	***COURSE TITLE***	***C.H.***	***CODE***	***COURSE TITLE***	***C.H.***
COMM 401	Internship and Service Learning	3	IENG 301	Engineering Economy	3
MENG 401	Introduction to Finite Elements in Mechanical Engineering	2	MENG 421	Heat Transfer II	3
NSCI 101	Selected Topics in Natural Sciences	3	MENG 422	Fluid Mechanics II	3
NSCI *, SSCI *** or HUMA *****	General Knowledge Elective	3	MENG 423	Combustion	3
MENG 405	Electronics, Instrumentation and Power Circuits	2	SSCI 102	Selected Topics in World Cultures and Diversity	3
MENG 420	Thermodynamics II	3			
	TOTAL CREDIT HOURS	**16**		***TOTAL CREDIT HOURS***	**15**

**All MATH, PHYS, CSCE, CHEM, MENG and ECEN courses include 2 hours tutorial/lab per week.*

Year 5					
Semester 9			**Semester 10**		
CODE	***COURSE TITLE***	***C.H.***	***CODE***	***COURSE TITLE***	***C.H.***
MENG 501	Practical Training	3	SSCI 103	Selected Topics in Social Sciences	3
MENG 424	Internal Combustion Engines	3	MENG 522	Computational Thermo-Fluid Mechanics	3
MENG 520	Turbo Machinery	3	MENG XXX	Track 2 Elective	3
MENG 521	Refrigeration and Cryogenics	3	MENG XXX	Track 2 Elective	3
HUMA 103	Selected Topics in Humanities and Arts	3	ENGR 541	Graduation Project II	3
ENGR 540	Graduation Project I	3			
	TOTAL CREDIT HOURS	**18**		***TOTAL CREDIT HOURS***	**15**

**All MATH, PHYS, CSCE, CHEM, MENG and ECEN courses include 2 hours tutorial/lab per week.*

General Knowledge Electives		
CODE	***COURSE TITLE***	***C.H.***
NSCI 102	Selected Topics in Natural Sciences	3
SSCI 103	Selected Topics in Social Sciences	3
HUMA 103	Selected Topics in Humanities and Arts	3

Track 1 Electives		
CODE	***COURSE TITLE***	***C.H.***
MENG523	Multiphase Flow	3
MENG524	Energy Conversion Systems	3
MENG525	Design and Optimization of Energy Systems	3
MENG526	Introduction to Renewable Energy	3
MENG527	Renewable Energy Systems Engineering	3
MENG530/IENG303	Operations Research	3
MENG531/IENG401	Project Management	3

COURSE DESCRIPTIONS

HUMANITIES AND SOCIAL SCIENCES (UNIVERSITY REQUIREMENTS)

HUMA 101: (2, *Lec. 3, Lab. 0, Tut. 0***) Introduction to Logic, Critical Thinking** The course is a study of the processes by which the intellect conceptualizes, applies, analyzes, synthesizes, and evaluates the information it gathers from observation, experience, reflection, reasoning and communication. The course also examines the elements of thought implicit in reasoning, such as assumptions; concepts, conclusions, implications, consequences and frame of reference. Problems of moral philosophy and moral judgments, such as cultural relativism and subjectivism are also addressed. Theoretical approaches for answering questions about right and wrong are considered.

HUMA 102: (1, *Lec. 1.5, Lab. 0, Tut. 0***) Introduction to Ethics** The emphasis of the course is on ethical issues and problems that arise in professional and business environments, such as integrity, civic responsibility, ethical conduct and misconduct, employee and corporate rights and responsibilities, and on issues concerning social and economic justice in a global economy.

SSCI 101 : (3, *Lec. 3, Lab. 0, Tut. 0***) Selected Topics in Egyptian and Arab Heritage** A course highlighting aspects of the extraordinarily rich Ancient Egyptian, Coptic and Islamic heritage of Egypt.

SSCI 102: (3, *Lec. 3, Lab. 0, Tut. 0***) Selected Topics in World Cultures and Diversity** This course exposes students to World Cultures both from a historical and a contemporary point of view. The course focuses on issues of globalization such as nationalism, struggle for identity and the conflicts caused by migration, racism, religious fundamentalism and terrorism. The course also emphasizes the positive aspects of multicultural societies, such as the sharing of resources and information and the increased understanding among the peoples of the world.

NSCI 102: (3, *Lec. 3, Lab. 0, Tut. 0***) Selected Topics in Natural Sciences** A course in any of the fields of physics, chemistry, biology, geology, or environmental science as outlined below:

(Conceptual Physics): A conceptual overview of classical and modern physics. Mechanics, electricity, light, atomic and nuclear physics, relativity theory.

(Man, and the Environment): A course about environmental factors and their positive and/or negative influences on human health, both on the individual, and public level, approaches to the protection and promotion of environment, the individual role within the global influence on environment.

(Energy and the Environment): the major energy conversion processes, their accompanying resource requirements, and impacts on air, water, soil, wildlife, and humans, drawing distinctions between applications in industrialized nations and developing countries.

SSCI 103: (3, *Lec. 3, Lab. 0, Tut. 0***) Selected Topics in Social Sciences.** A course in any of the fields of sociology, economics, education, history, anthropology, psychology, or geography as outlined below:

(Introduction to Psychology): This is a Critical Thinking Approach to Psychology. Students learn about the key issues in Psychology and the methods that Psychologists use to research these issues and interpret the results. Students also look at Psychology in the News and learn to evaluate empirical results from 'Psychobabble.

(World Civilizations): This is a critical thinking course about the emerging market countries of India, China, and Brazil. By exploring the accomplishments of the past for these great countries, we can better understand their way of thinking; identify commonalities of experience; and develop tools for thinking about the future. In this way, we will be better prepared for partnerships in the globalized economy.

HUMA 103: (3, *Lec. 3, Lab. 0, Tut. 0***) Selected Topics in Humanities and Arts** A course in any of the fields of Literature, Philosophy, Art, Music, or Sports.

(Understanding Art): An investigation into the nature of the visual arts with an emphasis on the issues and ideas that artists explore through their work and how these ideas translate into the artwork. Attention will be given to the interpretation or reading of the artwork and how it may relate to society.

(Understanding Music): An introduction to the appreciation of music, its elements and basic forms of music, with particular emphasis on the composer's creative process and the listener's participation. Methods of analytical and aesthetic appreciation will be applied to musical examples, with corollaries in literature, history, theater, and the visual arts.

(Introduction to Humanities): An introduction to the humanities through the study of some of the major developments in human culture, trying to analyze the assumptions about the way societies are formed and how they express their ideas through art, literature, architecture, music, and philosophy, developing conceptual tools to understand cultural phenomena.

NSCI *, SSCI *** or HUMA ***: (3,** *Lec. 0, Lab. 0, Tut. 0***) General Knowledge Elective** An additional course to be chosen from one of the above three General Knowledge categories: Natural Sciences, Social Sciences and Humanities & Arts.

MATHEMATICS AND BASIC SCIENCES

MATH 111: (3, *Lec. 3, Lab. 0, Tut. 1.5***) Analytical Geometry & Calculus I.**
The course starts with a review of the basics of Analytical Geometry: the Cartesian coordinate system, distance, slope, equation and graph of a line and curve sketching. The calculus part covers functions, limits, derivatives, polynomials, rate of change, L' Hospital's Rule, higher derivatives, Mean Value Theorem, related rates, maximum and minimum, differentiation formulas, the differential and related applications.

MATH 112: (4, *Lec. 3, Lab. 0, Tut. 1.5***) Calculus II**
PR: MATH 111. Translation and rotation of axes, conic sections (properties of conic sections- parabola, ellipse, hyperbola), Cartesian, cylindrical and polar spherical coordinates. *Integral calculus:* definite and indefinite integrals, integration methods and applications of integration, integration by substitution and by parts, Integration by trigonometric substitution and partial fractions; arc length; improper integrals; Simpson's and Trapezoidal Rules for numerical integration. Functions of several variables and multiple integrals.

MATH 201: (3, *Lec. 3, Lab. 0, Tut. 1.5***) Introduction to Probability & Statistics**
This course takes a non-calculus approach to probability and statistics; topics include permutations and combinations, independence, random variables, events, measures of location and variability, joint and conditional probability. The course also introduces descriptive and inferential statistics, including graphical methods and data description.

MATH 203: (4, *Lec. 3, Lab. 0, Tut. 1.5***) Differential Equations**
PR: MATH 102. Separable differential equations, first order linear differential equations, homogeneous second order linear differential equations with constant coefficients, series solution, Newton's method, Taylor's Theorem. First-Order, Second-Order and Higher-Order Linear Differential Equations, partial differential equations, and Laplace transforms.

MATH 301: (4, *Lec. 3, Lab. 0, Tut. 1.5***) Linear Algebra**
PR: MATH 203. Matrices and Gaussian elimination, Vector Spaces, Vector calculus, Orthogonality, Determinants, Eigenvalues and Eigenvectors, Positive definite matrices, Computations with matrices, Linear programming and Game theory.

MATH 303: (3, *Lec. 3, Lab. 0, Tut. 1.5***) Numerical Methods in Engineering**
PR: MATH 201 and MATH 301. This course offers an introduction to numerical methods in science and engineering. The course covers: root finding, solving systems of equations, finding eigenvalues and eigenvectors, interpolation of data or functions, numerical differentiation and integration, solving ordinary and partial differential equations. Introduction to finite difference method. MATLAB shall be heavily implemented in this course**.**

PHYS 101: (4, *Lec. 3, Lab. 1.5, Tut. 1.5***) Physics I**

PR: MATH 110 or MATH 111. Measurements: Standards of length, mass, and time, dimensional analysis, the International system of units SI, conversion of units. Mechanics: Newton's laws and applications, potential and kinetic energy, satellite motion and Kepler's laws. Electrostatics: electric charge and Coulomb's law: insulators and conductors, electrostatic field, Gauss' law, potential, potential energy, dielectrics and capacitances, displacement vector, energy stored in the electrostatic field. Electrodynamics: electromotive force, voltage, electric current, resistance, Ohm's law, electric power, direct current circuits, Kirchhoff's laws, multi loop circuits. Magnetism: magnets, magnetic field, force on a current-carrying conductor, Ampere's law and applications, induction, Faraday's law, Lenz's law, inductors, energy stored in a magnetic field, mutual induction, magnetism of matter. Relevant lab experiments will be conducted.

PHYS 201: (4, *Lec. 3, Lab. 1.5, Tut. 1.5***) Physics II**

PR: PHYS 101 and MATH 111. Optics: Interference, Diffraction, Polarization, electric and magnetic properties of light. Fluid Dynamics: hydrostatic pressure, Pascal's principle, Archimedes' principle, Dynamics of ideal fluids: continuity equation, Bernoulli's equation, viscosity. Thermodynamics: The nature of heat, the laws of thermodynamics, temperature, thermal expansion, absorption of heat by solids and liquids, heat transfer mechanisms, kinetic theory of gases, ideal gases, distribution of molecular speed, molar specific heat, degrees of freedom, entropy, reversible and irreversible processes. Solid state physics: conductors, insulators and semiconductors. Modern Physics: atoms and molecules, nuclear structure, nuclear fission and fusion and the quantum. Relevant lab experiments will be conducted.

CHEM 101: (3, *Lec. 3, Lab. 1.5, Tut. 0***) Chemical Principles**

Mass and Energy balance, dynamic equilibrium in physical and chemical processes, concepts of rate processes, energy and mass transport, and kinetics of chemical reactions, combustion processes of fuels Electrochemistry and corrosion. Applications of these concepts to areas of current technological importance: biotechnology, production of chemicals, chemical pollution, materials processing, and water treatment and purification. Relevant lab experiments will be conducted.

ENGINEERING COURSES

ENGR 101: (3, *Lec. 1.5, Lab. 0, Tut. 3***) Introduction to Engineering Disciplines**
The course gives freshmen an overview of the main engineering disciplines thus helping them make the right choice regarding their future careers. Case studies in engineering are used to illustrate engineering and scientific principles. The students are also trained on Engineering drawing and drafting using both free hand sketching, and manual drafting and also using AutoCAD. The students acquire the required engineering drawing skills including orthographic representation of shapes, sections and dimensioning. Students are also familiarized with some of the important engineering tools for problem solving, such as MATLAB.

ENGR 102: (3, *Lec. 1.5, Lab. 0, Tut. 3***) Engineering Design**
PR: ENG 101. An introduction to the methods, tools, and processes related to engineering design. The course gives the student the ability to communicate by means of engineering drawing. Building on the engineering drawing contents offered in ENGR 101, students acquire the skills of dealing with complex mechanical systems using assembly drawing techniques, fits and tolerances. The students are also familiarized with some of the important engineering tools for graphical modeling including Computer-Aided Drawing (CAD). Group projects and case studies in engineering are used to illustrate engineering and scientific principles.

ECEN 101: (3, *Lec. 3, Lab. 0, Tut. 1.5***) Electric Circuits**
PR: PHYS 101. Basic electrical concepts and network theorems, circuit laws, resistance, capacitance, inductance; response of RC, RL and RLC circuits to initial conditions and constant forcing functions; AC steady-state analysis and AC power. Computer applications (using SPICE or similar tools).

MENG 101: (3, *Lec. 3, Lab. 0, Tut. 1.5***) Engineering Mechanics**
PR: MATH 111. Space vectors, resultant of forces, moment, equations of equilibrium of a rigid body, types of supports, equilibrium of systems, mass center, moment of inertia, displacement, velocity and acceleration of a particle, trajectory equations, use of Cartesian coordinates to describe particle motion, projectiles, polar axes, relative motion, Newton's law of motion, resistive media, simple harmonic motion of a particle, motion on circular path, work and Kinetic energy, conservative forces, conservation of energy, impulse and momentum, eccentric impact of two particles.

ENGR 201: (4, *Lec. 3, Lab. 1.5, Tut. 1.5***) Solid Modeling & Workshop**
PR: ENGR 102. The course covers the foundations of solid modeling techniques and parametric modeling tools using standard Computer Aided Design software. The students learn the basic machine shop operations covering both metal cutting, forming and welding processes. In the workshop the students learn how to use basic machine shop equipment and tools and how to operate them safely.

IENG 301: (3, *Lec. 3, Lab. 0, Tut. 0***) Engineering Economics**
Introduction to the concepts of determining the economic feasibility of engineering undertakings, especially the time value of money, interest rates, depreciation, replacement, economic life, present value, rate of return, payback period. Other topics will include financing, supply and demand, private and social cost estimations, secondary and intangible benefits and costs, benefit-cost models, economic risk analysis and economic optimization.

IENG 302: (3, *Lec. 3, Lab. 0, Tut. 0***) Safety Engineering**
The focus of the course is on a system engineering approach to safety, causes of accidents, accident analysis and control, techniques used in safety analysis, safety management and organization, risk management, training, human behavioral approach in safety.

MECHANICAL ENGINEERING CORE COURSES & TRACKS

MENG 201: (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) Introduction to Solid Mechanics and Strength of Materials**
PR: PHYS 201 and MENG 101. Statics: moment and force resultants, equilibrium. Mechanics of deformable bodies: stress/strain, classification of material behavior, generalized Hooke's law. Engineering applications: axial loads, torsion of circular rods and tubes, bending and shear stresses in beams, deflection of beams, combined stresses, stress and strain transformation. Bending of beams of asymmetrical cross-section; shear center and torsion of thin-walled sections; membrane stresses in axisymmetric shells.

MENG 202/IENG 202 (cr. 3, *Lec. 1.5, Lab. 3, Tut. 0***) Manufacturing Technology**
Modeling and quantitative analysis of manufacturing processes used in industry to manufacture mechanical systems: machining, deformation, welding assembly, surface treatment, and solidification. Process costs and limits; influence of processes on the final mechanical properties of the product. Reconfigurable manufacturing.

MENG 301: (cr. 2, *Lec. 1.5, Lab. 0, Tut. 1.5***) Mechanical behavior of Materials**
PR: MENG 201. Material microstructures, dislocations and defects; processing and mechanical properties of metals, polymers, and composites; heat treatment of metals; elastic, plastic, and viscoelastic behavior of materials, strain hardening; fracture, fracture mechanics, fatigue and multiaxis loading; creep and stress relaxation; materials-related design issues, materials selection, corrosion and environmental degradation of materials

MENG 302: (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3.0***) Mechanics II (Rigid Body Dynamics)**
PR: MATH 203, MATH 301, PHYS 101 and MENG 101. Vector description of force, position, velocity and acceleration in fixed and moving reference frames. Kinetics of particles, of assemblies of particles and of rigid bodies. Energy and momentum concepts. Euler's equations.

MENG 303: (cr. 2, *Lec. 3, Lab. 0, Tut. 0***) Introduction to Engineering Materials**
PR: CHEM 101. Structures of polymers, metals, and ceramics as the basis for their mechanical behavior. Manipulation of structure through such processes as heat treatment and solidification. Mechanisms of material failure in service (yielding, fracture, fatigue, creep, corrosion, and wear) and simple design techniques to avoid these failures. Strategies for materials selection in design.

MENG 304: (cr. 2, *Lec. 1. 5, Lab. 1.5, Tut. 0***) Mechanical Measurements**
PR: PHYS 101 and PHYS 201. Static and dynamic characteristics of instruments, statistical analysis of measurement errors, variable conversion elements and signal amplification. Metrology, measurement of strain and force, pressure, flow, temperature and power.

MENG 305: (cr. 3, *Lec. 1.5, Lab. 0, Tut.3***) Machine Design**
PR: ENGR 201, MENG 201 and MENG 303. Design and analysis of machinery for load-bearing and power transmission. Consideration of material failure modes, including yielding, fracture, fatigue, and creep. Design and selection of machine elements: bolts, springs, rolling-element bearings, fluid-film lubrication, and power transmissions, including gears and friction drives. Application of the acquired knowledge on designing a stand-alone product such as bench press or pump for example.

MENG 307: (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) Thermodynamics I**
PR: MATH 112, CHEM 101 and PHYS 101. Introduction to engineering thermodynamics. First law, second law system and control volume analyses; properties and behavior of pure substances; application to thermodynamic systems operating in a steady state and transient processes. Typical power producing cycles and refrigerators. Ideal gas mixtures and moist air applications.

MENG 308: (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) Fluid Mechanics I**
PR: MATH 112 and MATH 203. Fluid statics; conservation of mass, momentum, and energy in fixed and moving control volumes; steady and unsteady Bernoulli's equation; differential analysis of fluid flow; laminar and turbulent flow; boundary layers; lift and drag; introduction to commercial CFD packages.

MENG 309: (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) Heat Transfer I**
PR: MATH 203 and MENG 307. Heat transfer by conduction, convection, radiation; heat storage, energy conservation; steady-state/transient conduction heat transfer; thermal circuit modeling; multidimensional conduction; surface radiation properties, enclosure radiation exchange; boiling and condensation; heat exchangers; design of thermal systems, solvers for problem solving/ design.

MENG 311: (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) Kinematics and Dynamics of Mechanical Systems**
PR: MENG 101 and PHYS 201. Position, velocity, and acceleration of mechanisms, cams, gears and gear trains, machine dynamics, rotating and reciprocating machines, balancing techniques and flywheel design and/or selection.

MENG 312: (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) Modeling and Simulation of Dynamic Systems**
PR: MENG 101 and MENG 311. Developing mathematical models of dynamic systems, including mechanical, electrical, electromechanical, and fluid/thermal systems, and representing these models in transfer function and state space form. Analysis of dynamic system models, including time and frequency responses. Introduction to linear feedback control techniques. Synthesis and analysis by analytical and computer methods.

MENG 401: (cr. 2, *Lec. 1.5, Lab. 0, Tut. 1.5***) Introduction to Finite Elements in Mechanical Engineering**
PR: MATH 112, MATH 203, MATH 301 and MENG 201. Displacement approach for simple elements in structural mechanics. Generalization to three-dimensional elements. Overview of the finite element method (FEM), variational principles, transformation, assembly, boundary conditions, solutions, convergence and stability. Isoparametric elements. Applications to solid mechanics, heat conduction and coupled problems. Pre- and post-processing. Integration of FEM in Computer Aided Design.

MENG 405: (cr. 2, *Lec. 1.5, Lab. 1.5, Tut. 0***) Electronics, Instrumentation and Power Circuits**

PR: PHYS 101 and ECEN 101. Modern instrumentation. Basic circuit design, standard microelectronic circuits. Digital data acquisition and control. Signal conditioning. Instrumentation interfacing. Power electronics Designing and testing of analog circuits. Laboratory experiments.

MENG 410: (cr. 3, *Lec. 1.5, Lab. 1.5, Tut. 1.5***) Mechanical Vibrations**
PR: MATH 203, MATH 301, PHYS 101, MENG 101 and MENG 312. Free and forced responses of one and two degree of freedom systems. Applications to engineering systems involving vibration isolation, rotating imbalance and vibration absorption. Elements of vibration measuring systems, frequency analysis of mechanical vibration, introduction to condition monitoring fault detection and passive vibration control techniques.

MENG 414: (cr. 3, *Lec. 1.5, Lab. 1.5, Tut. 1.5***) Automatic Control**
PR: MENG 312. Feedback control design and analysis for linear dynamic systems with emphasis on mechanical engineering applications; transient and frequency response; stability; system performance; control modes; state space techniques; digital control systems.

MENG 416: (cr. 3, *Lec. 1.5, Lab. 1.5, Tut. 1.5***) Fundamentals of Mechatronics Engineering**
***PR: MENG 405* and MENG 312.** Electromechanical system modeling, Control and Applications. Design of Electronic Interfaces and Controllers for Mechanical Devices. Sensor Technology, Signal acquisition, Filtering, and Conditioning. Microcontroller-based Closed-loop Control. Device Communications Sensor and actuator selection, installation, and application strategies.

MENG 418: (cr. 3, *Lec. 1. 5, Lab. 0, Tut. 3***) Pneumatic and Hydraulics Control Systems**
PR: MENG 312. Hydraulics: Basics of fluid power transmission, operating principals of hydraulic systems, advantages and limitations, hydraulic systems elements' structure and design considerations (pumps, hydraulic motors, cylinders, directional valves, control valves, auxiliaries, servo elements). Hydraulic system circuit design, power circuits, control and logic circuits, standard circuits, power packs and integrated circuits, piping and related matters, economical considerations, application of hydraulic systems in machinery. Mathematical modeling of hydraulic systems.
Pneumatics: Basics of power transmission by gas, operating principals of pneumatic systems, advantages and limitations, pneumatic systems elements' structure and design considerations. Compressed air production technology and related problems, compressed network, piping design, economical considerations. Design of pneumatic circuits, application of pneumatic in special production machines. Mathematical modeling of hydraulic systems.

MENG 420 (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) Thermodynamics II**
PR: MENG 307. Thermodynamic power and refrigeration systems; availability and evaluation of thermodynamic properties; general thermodynamic relations, equations of state, and compressibility factors; chemical reactions; combustion; gaseous dissociation; phase equilibrium. Design and optimization of thermal systems.

MENG 421 (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) Heat Transfer II**
PR: MENG 309. Advanced topics in conduction and convection including the presentation of several solution methods (semi-quantitative analysis, finite difference methods, superposition, separation of variables) and analysis of multi-mode heat transfer systems. Fundamentals of radiation heat transfer including; blackbody radiation, radiative properties, view factors, radiative exchange between ideal and non-ideal surfaces.

MENG 422 (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) Fluid Mechanics II**
PR: MENG 308***.*** Fundamental concepts and methods of fluid mechanics; inviscid flow and Bernoulli theorems; potential flow and its application; Navier-Stokes equations and constitutive theory; exact solutions of the Navier-Stokes equations; boundary layer theory; integral momentum methods; introduction to turbulence. Use of commercial CFD packages for solving realistic fluid mechanics and heat transfer problems of practical interest. Introduction to mesh generation, numerical discrimination, stability, convergence, and accuracy of numerical methods. Applications to separated, turbulent, and two-phase flows, flow control, and flows involving heat transfer. Open-ended design project.

MENG 423 (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3*) **Combustion**
PR: MENG* 308 *and MENG 420. Introduction to combustion processes; combustion thermodynamics, reaction kinetics and combustion transport. Chain reactions, ignition, quenching, and flammability limits, detonations, deflagrations, and flame stability. Introduction to turbulent premixed combustion. Applications in IC engines, furnaces, gas turbines, and rocket engines.

MENG 510: (cr. 3, *Lec. 1.5, Lab. 1.5, Tut. 1.5*) **Digital and Industrial Control systems**
PR: MENG 414. Description and Modeling of Digital Systems Structural and behavioral specification. Digital circuit simulation, digital circuit synthesis, tools and design process. Combinatorial and sequential circuits, memory, busses, interfaces. Digital Circuit Elements Programmable logic, FPGA, memory modules, microprocessors. Circuit design, routing, delay. Advantages of using PLCs in industrial automation, Basic components of a PLC, Interfacing sensors and actuators to PLCs, Programming of PLCs by ladder logic, Internal markers, Timers, Counters, Conditional jumps and Master Control function, PLC program design, PLC program development for control applications, Advanced Sequential Control Techniques, Data handling instructions, A/D and D/A PLC modules, Basic elements of DCS, Differences between DCS and SCADA. Application of linear control theory to experimental study of hydraulic and pneumatic control systems.

MENG 512: (cr. 3, *Lec. 1.5, Lab. 1.5, Tut. 1.5*) **Signal Processing**
PR: MENG 312. Basic electromechanical techniques used in modern instrumentation and control systems. Use of transducers and actuators. Signal conditioning, grounding, and shielding. Analog and digital signal processing and feedback control methods with emphasis on frequency domain techniques. Frequency response of continuous and discrete systems. Static and dynamic instrument characteristics, statistics and analysis and noise in signal analysis and treatment

MENG 514: (cr. 3, *Lec. 1. 5, Lab. 1.5, Tut. 1.5*) **Microprocessors and Microcontrollers**
PR: MENG 405. Microprocessor/Microcontroller architecture. Interrupts, serial and parallel Input/Output, Analog-to-Digital and Digital-to-Analog conversion, Watchdog timers, I/O expansion, AC control. Introduction to C/assembly language.

MENG 515: (cr. 3, *Lec. 1.5, Lab. 1.5, Tut. 1.5*) **Robotics**
PR: MENG 414 and MENG 311. Introduction to the central topics in robotics, including geometry, kinematics, differential kinematics, dynamics, and control of robot manipulators. The mathematical tools required to describe spatial motion of a rigid body will be presented in full. Motion planning including obstacle avoidance is also covered.

MENG 516: (cr. 3, *Lec. 1.5, Lab. 1.5, Tut. 1.5*) **Advanced Mechatronics – Integrated Design of Electromechanical Systems**
PR: MENG 416. General background in electromechanical systems, electrical machines, and energy conversion. The main focus of this course is on the development and study of advanced electromechanical motion devices. Design of Electronic Interfaces and Controllers for Mechanical Devices. Sensor and actuator selection, installation, and application strategies. Microcontroller-based Closed-loop Control. Bus technologies. Control law design vs. implementation. Mechatronics design and simulation. Projects to develop students ability to deal with advanced electromechanical systems using the MATLAB/Simulink/(NI or DSpace) environment.

MENG 517: (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) MEMS Devices and Systems**
PR: MENG 414. Introduction to principles, fabrication techniques, and applications of microelectromechanical systems (MEMS). Gives in-depth understanding of sensors, actuator principles, and integrated microfabrication techniques for MEMS. Comprehensive investigation of state-of-the-art MEMS devices and systems.

MENG 518: (cr. 3, *Lec. 1. 5, Lab. 1. 5, Tut. 1.5***) Computer Control of Manufacturing Processes**
PR: MENG 414 and MENG 202. Architecture, interfacing and programming. Emphasis is on computer integrated manufacturing with computer numerical control of machine tools, automation via programmable logic controllers, motion control, process control examples, and manufacturing process monitoring.

MENG 519: (cr. 3, *Lec. 1.5, Lab. 1.5, Tut. 1.5***) Modern Control Theory**
PR: MENG 414. Theory and application of adaptive control of linear systems in both continuous and discrete time domain. Real-time parameter estimation algorithms, direct and indirect adaptive methods, deterministic self-tuning regulators, Lyapunov stability theory, input-output stability, model-reference adaptive control, stability and convergence of adaptive algorithms, robustness, and implementation issues, with laboratory experiments and demonstrations. Introduction to digital control.

MENG 424 (cr. 3, *Lec. 1. 5, Lab. 1. 5, Tut. 1. 5***) Internal Combustion Engines**
PR: MENG 420. Analytical approach to the engineering problem and performance analysis of internal combustion engines. Study of thermodynamics, combustion, heat transfer, friction and other factors affecting engine power, efficiency, and emissions. Design and operating characteristics of different types of engines.

MENG 520 (cr. 3, *Lec. 1. 5, Lab. 0, Tut. 3***) Turbo Machinery**
PR: MENG 420 and MENG 422. Cavitation phenomenon in water turbines: Theory, Effects and avoidance. Water hammer phenomenon in pipelines: Theory, Effects and methods of protection. Hydraulic turbines: Theory, Turbine Classifications, Construction, Power calculations, Performance, Power house and environmental Impact, Non- conventional turbomachinery applications. Centrifugal pumps: Theory, Construction, Performance, Operation, Cavitation, Axial and radial thrust, Maintenance trouble shooting and selection. Positive displacement pumps: Reciprocating pumps, Diaphragm pumps. Rotary pumps: gear pump, Vane type rotary pump, Rotary piston pumps, Radial cylinder pumps, Parallel cylinder pumps.

MENG 521 (cr. 3, *Lec. 1. 5, Lab. 0, Tut. 3***) Refrigeration and Cryogenics**
PR: MENG 420 and MENG 421. Theory of operation and design of equipment for production of low temperatures, from below ambient to near absolute zero; industrial, consumer, aerospace, medical, and research applications.

MENG 522 (cr. 3, *Lec. 1. 5, Lab. 0, Tut. 3***) Computational Thermo-Fluid Mechanics**
PR: MENG 421 and MENG 422. Numerical techniques for solving the equations governing conduction and convective heat transfer in steady and unsteady fluid flows: finite-difference and finite-volume techniques, basic algorithms, and applications to real-world fluid-flow and heat-transfer problems.

MENG 523 (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) Multiphase Flow**
PR: MENG 422. Selected topics in multiphase flow including nucleation and cavitation, dynamics of stationary and translating particles and bubbles, basic equations of homogeneous two-phase gas/liquid,

gas/solid, and vapor/liquid flows, kinematics and acoustics of bubbly flows, instabilities and shock waves in bubbly flows, stratified, annular, and granular flow.

MENG 524 (cr. 3, *Lec. 1. 5, Lab. 0, Tut. 3***) Energy Conversion Systems**
PR: MENG 420, MENG 421 and MENG 422. Processes and systems for energy conversion, including power and refrigeration cycles, air conditioning, thermoelectric and fuel cells; ideal-gas mixtures and psychrometric with applications to power plants and introduction to renewable energy.

MENG 525 (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) Design and Optimization of Energy Systems**
PR: MENG 420, MENG 421 and MENG 422. Application of the principles of thermodynamics, fluid mechanics, and heat transfer to the design of thermal systems with an emphasis on modeling, simulation, economic analysis, and optimization. Systems to be studied include heat exchangers, thermal storage devices, fluid machinery, pipes and ducts, and electronics cooling devices.

MENG 526 (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3***) Introduction to Renewable Energy**
PR: MENG 420, MENG 421 and MENG 422. An introductory course on renewable energy. Students will learn the fundamental principles of the various renewable energy options and their applications and costs. After taking this course, students will be familiar with the economic and societal impact of renewable energy systems, and be able to participate in the design or selection of renewable energy systems.

MENG 527 (cr. 3, *Lec. 1. 5, Lab. 0, Tut. 3***) Renewable Energy Systems Engineering**
PR: MENG 526. This course covers the design, commissioning and testing of standalone and grid-connected renewable energy systems. Topics: categories of standalone systems, simulation and system design, component sizing, housings and layout, cabling, earthing, commissioning, testing, monitoring, safety and standards; specification, design, impact, cost and performance of grid-connected systems; relevant power system issues; power conditioning for grid applications. The unit will develop a thorough understanding of entire integrated systems as well as providing practical experience with working physical systems.

MENG 530 (cr. 3, *Lec. 1. 5, Lab. 0, Tut. 3***)/ IENG 303 (3) Operations Research**
PR: MATH 201. This course is designed to give a broad foundation in Operational Research (OR), and to provide an understanding of the techniques of OR and develop the skills required to incorporate these techniques in the management decision process. The course provides training in the mathematical and computational foundations of OR and experience in modeling practical decision problems. There is a focus on risk management and computational optimization, and evolving application areas such as finance, telecommunications, energy and data mining.

MENG 531 (cr. 3, *Lec. 1.5, Lab. 0, Tut. 3*)**/ IENG 401 (3) Project management**
PR: MENG 530/IENG 303. This course addresses the fundamental of project management, as well as the tools and techniques necessary to manage complex projects. These principles, largely developed and tested on engineering projects, are being successfully applied to projects of all sizes and types within the business world. They are also fully aligned with the industry standard Project Management Book of Knowledge (PMBOK), published by the worldwide Project Management Institute (PMI). The course will enable students to master projects planning, scheduling and estimating; developing approval process, including testing for alternatives; understanding project information.

MENG 501: (cr. 3, *Lec. 0, Lab. 0, Tut. 0*) **Practical Training**
PR: Senior Standing – Completion of 138 Credit Hours. A minimum of four weeks of practical training in off-campus sites elected by the department. Students are required to submit a recognition letter from the site where they received their training, in addition, a report and a presentation are submitted as well. Course is a Pass/Fail course.

ENGR 540 (cr. 3, *Lec. 3, Lab. 0, Tut. 0*) **Graduation Project I**
PR: Senior Standing - Completion of 138 credit hours. Application-oriented capstone project to show competence in major academic area, where an independent research project is conducted under the guidance of a faculty member in the IEMS Department. The research should contribute to the advancement of knowledge in the field. Written report and formal presentation are required.

ENGR 541 (cr. 3, *Lec. 3, Lab. 0, Tut. 0*) **Graduation Project II**
PR: ENG 540 (Graduation Project I). The continuation and completion of the capstone project***.***

OTHER COURSES

CSCE 101 (cr. 3, *Lec. 1.5, Lab. 1.5, Tut. 1.5***) Computer & Information Skills** The goal of the course is to help the student develop the basic research and information technology skills needed to succeed in their academic and later professional careers. These skills include defining information needs, efficient use of web resources, managing data, basics of data bases, effective research methodologies, evaluation of research results and communicating these results in electronic form –via programs such as, but not limited to, WORD, POWERPOINT, EXCEL and ACCESS.

CSCE 201 (cr. 3, *Lec. 1.5, Lab. 1.5, Tut. 1.5***) Introduction to Programming** Introduction to the process of program design and analysis using the C ++ and the Java programming languages. The course provides basic understanding of programming concepts; constructs, data types, looping, nesting, functions, arrays, objects and classes. The topics also include good programming practices, modularity, reusability and ease on maintenance.

COMM 401 (cr. 3) Internship & Service-Learning Student internships provide on-the-job training opportunities to students that help them gain experience in their fields, develop an interest in a particular career, and create a network of contacts. Service-learning enriches learning by engaging students in meaningful service to their communities. Students apply academic skills to solving real-world problems and linking their learning with genuine needs. They also learn to apply critical thinking and problem-solving skills to global concerns such as hunger, pollution, and diversity. Students spend a full month of non-lecture time on their internship/service-learning activity and submit a report at the end.

ENGL 101 (cr. 3, *Lec. 3, Lab. 0, Tut. 1.5***) English I** the goal of the course is to develop college skills of reading, writing and critical thinking, to know how to select a topic, explore and organize ideas, use vocabulary efficiently, use correct grammatical structures and write an essay ranging between three to five paragraphs.

ENGL 102 (cr. 3, *Lec. 3, Lab. 0, Tut. 1.5***) English II**
PR: ENGL 101 English I. The goals of the course include: Locating materials through observation, analysis and critical reading, developing a focused thesis statement, developing well-structured paragraphs composed of an introduction, a body and a conclusion. Use of summarizing and paraphrasing skills.

ENGL 201 (cr. 3, *Lec. 3, Lab. 0, Tut. 1.5***) Writing Skills**
PR: ENGL 102 English II. The goals of the course include: Locating materials for a research topic, using library and internet resources, summarizing articles and books, using quotation and source citation for professional papers, using inductive and deductive reasoning, developing the skills of scientific argumentation, persuasion, evaluation and criticism needed for a research paper.

ENGL 202 (cr. 3, *Lec. 3, Lab. 0, Tut. 1.5***) Communication & Presentation Skills**
PR: ENGL 201 Writing Skills. This course helps students learn and practice the skills of interpersonal and professional communication. Psychological, social, cultural and linguistic aspects of communication are considered. Attention is given to human perceptions, interpersonal dynamics, patterns of inference, the arts of listening and convincing, as well as to the value of verbal and visual symbols. The course also helps students improve their skills in oratory, argumentation and public presentation.