

Admissions/Retention Requirements:

All engineering students who plan to take upper division engineering courses, 3000 and 4000 level courses, must have passed the Engineering Entrance Examination (EEE) with a minimum score of 75% on each part (calculus, chemistry, and physics) of the examination.

Engineering Entrance Examination:

The eligibility criteria for taking the Engineering Entrance Examination are:

1. Minimum grade of "C" in each of the following courses: CHEM 1110, 1111; MATH 1915, 1925; PHYS 2110, 2111, 2120.
2. Minimum cumulative GPA of 2.5 for the group of courses listed above in Item 1 at the time of taking the Engineering Entrance Examination.
3. Completion and submission of the engineering entrance examination eligibility form to the Dean's Office at least one week prior to the examination.
4. A student must earn a grade of B or better in several of the following courses: CHEM 1110, 1111; MATH 1915, 1925; PHYS 2110, 2111, and 2120 to meet the minimum cumulative 2.5 GPA requirement for this group of courses.

The Engineering Entrance Examination is given at least five times per year. The dates for the examination may be obtained from the Dean's Office. Each student is allowed three (3) attempts to pass the engineering entrance examination.

After the second unsuccessful attempt, the student is required to repeat at least two of the following courses: CHEM 1110; MATH 1915, 1925; PHYS 2110, 2120 before the examination can be taken a third and final time.

Admission of Transfer Students:

Transfer students from other institutions of higher education who plan to enter the College of Engineering, Technology and Computer Science must meet University admission criteria. Engineering transfer students must first take and pass the Engineering Entrance Examination (EEE) before taking 3000 and 4000 level courses.

Specific College Requirements:

1. No student will be allowed to take any departmental courses, major courses, engineering courses, mathematics, and/or science courses without having successfully completed the proper prerequisites for those courses with a

- grade of “C” or better.
2. Students earning a grade of “D” or lower in a mathematics course(s), science course(s), departmental course(s), or a major course(s) must repeat that course(s) the very next time the course(s) is offered.
 3. All College students must take and successfully complete all components of the Rising Junior Examination (RJE) during the junior year.
 4. Each student must complete a practicum prior to graduation. A practicum may include, but is not limited to, an industrial internship, co-operative education experience, research experience, assistant in an engineering or technology laboratory, and other engineering/technology practical experiences. The practicum must be approved in advance by the student’s academic advisor and department head. The practical experience must be at least eight (8) continuous weeks in length. A comprehensive report on at least one practicum is required. The report must be cosigned by a supervisor. The practicum report is to be given to the student’s faculty advisor. The Dean’s office will assist students in locating a practicum.

Engineering Programs Core Requirements:

All engineering students are required to take the following engineering core courses: Mathematics (20 semester hours): MATH 1915, 1925, 2115, 2125, 3120; ENGR 3400; Science (12 semester hours): CHEM 1110, 1111; PHYS 2110, 2111, 2120, 2121; Engineering Science (18 semester hours): ENGR 2000, 2001, 2010, 2110 2120, 3300; Design (5 semester hours): ENGR 3200, 4500, 4510; Humanities (9 semester hours of which three (3) hours must be a sophomore literature course from the approved Humanities/Fine Arts list); Social Science (6 semester hours); History (6 semester hours): HIST 2010, 2020 or 2030; Social Science Electives* (6 semester hours); Other (15 semester hours): ENGL 1010, 1020; COMM 2200; ENGR 1001, 1011, 1151, 2211 or 2221 or 2231, 4201**, 4900; Engineering Orientation (1 semester hours). Total Engineering Core - 91 semester hours.

*Humanities and Social Science electives must be chosen from an approved list with the approval of the academic advisor.

**ENGR 4201 is only offered during the fall semester (see graduation requirements).

Graduation Requirements:

In addition to the University requirements for graduation, the following specific College graduation requirements must be met by students in the College:

Students may graduate with a maximum of two “D” grades earned in the last two semesters of the senior year. All other “D” grades earned in courses prior to the senior year must be repeated the very next time the courses are offered until a

minimum grade of “C” is earned. If a graduating senior earns more than two grades of “D” during the senior year, that senior will not graduate until that senior has only two grades of “D”.

All College graduating seniors must take and successfully complete all components of the Exit Examination during the senior year.

Engineering students must take and pass ENGR 4201 EIT Review Laboratory and they must take the Fundamental of Engineering Examination the same semester they take ENGR 4201 EIT Review Laboratory course.

Accreditation:

The Bachelor of Science degree program in Mechanical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET).

Academic Programs:

As one of the excellent Mechanical Engineering programs, The Department of Mechanical Engineering at Tennessee State University provides students with an outstanding education. Our small class sizes allow for personal contact between faculty and students. Strong advising allows our students to develop close relationships with the faculty. Our Program draws students from the nation and from many foreign countries. Our outstanding students and alumni, and many of our important characteristics indicate why Tennessee State University would be the best place for you to study Mechanical Engineering.

The Mechanical and Manufacturing Engineering Department allows students to pursue the traditional Mechanical Engineering program with emphasize on design with flavor of manufacturing engineering. Our curriculum exposes students to hands-on experience through laboratory work and design projects. The program prepares students for rewarding careers in the profession.

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CURRICULUM FOR B.S. DEGREE IN M.E. PROGRAM *EFFECTIVE: FALL 2004*

FRESHMAN YEAR

FALL SEMESTER

SPRING SEMESTER

Courses

EM 1110 General Chemistry I
 EM 1111 General Chemistry I Lab
 GL 1010 Freshman English I
 GR 1000 Orientation for Engineering
 GR 1001 Introduction to Engineering I
 Engineering Design
 GR 1151 Graphics
 MATH 1915 Calculus I

HR Courses

3 ENGL 1020 Freshman English II
 1 ENGR 1011 Introduction to Engineering II
 3 HIST 2010 American History I
 1 MATH 1925 Calculus II
 1 PHYS 2110 General Physics I
 1 PHYS 2111 General Physics I Lab

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SUMMER SESSION

MATH 2115 Calculus III	3	
IYS 2120 General Physics II	3	
IYS 2121 General Physics II Lab	<u>1</u>	
	7	

SOPHOMORE YEAR

MM 2200 Public Speaking	3		ENGR 2000 Circuits I
GR 2110 Statics	4		ENGR 2001 Circuits I Lab
GR 22X1 Computer Programming	1		ENGR 2120 Dynamics
MATH 2125 Calculus IV	3		ENGR 2010 Thermodynamics
Humanities Elective	<u>3</u>		MATH 3120 Applied Mathematics
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Students are required to pass the ENGINEERING ENTRANCE EXAMINATION prior to enrolling in Engineering Upper [300-400] level courses. Also they are required to take the Rising Junior Examination (RJE).

JUNIOR YEAR

EN 3100 Fluid Mechanics	3		CVEN 3100 Fluid Mechanics
EN 3120 Mechanics of Materials	3		HIST 2020 American History II
EN 3121 Mechanics of Materials Lab	1		MEEN 3100 Materials Processing
ENR 3200 Introduction to Design	3		MEEN 3220 Design of Machine Elements
ENR 3300 Materials Science	2		MEEN 3250 Computer Aided Design
ENR 3400 Numerical Analysis	3		MEEN 3521 Manufacturing Processes Lab
EN 3511 Measure. & Instrument. Lab	<u>1</u>		
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A practicum and verification required for graduation.

SENIOR YEAR

ENR 4201* F.E. Review	0		ENGR 4510 Capstone Design Project II
ENR 4500 Capstone Design Project I	1		MEEN 4021 Thermal and Fluid Systems Lab
ENR 4900 Prof. Development Seminar	1		MEEN 4250 Thermal and Fluid Systems Design
EN 4011 Mechatronics Lab	1		*** Design Elective
EN 4150 Heat Transfer	3		** Social Science Elective
EN 4230 Machine Design	3		** Social Science Elective
Humanities Elective	3		**Humanities Elective
Technical Elective	<u>3</u>		
	15		

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Engineering (FE) Examination in the same semester ENGR 4201 is taken, and one semester before graduation. The student must provide evidence that he/she has filed the application to take the FE Examination before filing for graduation. ENGR 4201 is offered only during the Fall Semester.

** This Elective must be chosen from an approved list of general education courses with advisor's approval.

*** MEEN Technical and Design Elective courses must be chosen with approval from major academic advisor.

A practicum is required for eight (8) continuous weeks.

General Statement

The Mechanical Engineering program systemically builds upon the knowledge acquired in the study of the physical sciences, mathematics, and engineering sciences to provide the student with a broad base in the various areas of mechanical and manufacturing engineering, and prepares them for careers in the private and public sectors and/or to pursue graduate study. Students may orient their program toward the mechanical design, or manufacturing engineering, or thermal-fluid systems design.

Mechanical Engineering Design Experience: A major curriculum objective is to provide mechanical engineering students with the ability to systematically apply engineering fundamentals to the design of mechanical, thermal and manufacturing components and/or systems. Courses with engineering design content are integrated throughout the mechanical engineering curriculum.

The engineering design experience begins in the freshman year with ENGR 1011-Introduction to Engineering II. The design experience continues in the sophomore year with ENGR 2010- Thermodynamics, ENGR 2110-Statics, and ENGR 2120-Dynamics. The sequence is followed in the Junior year with an interdisciplinary design course: ENGR 3200-Introduction to Design.

The Mechanical Design and Manufacturing sequence begins in the junior year with MEEN 3210-Mechanism Design, CVEN 3120-Mechanics of Materials, MEEN 3220-Design of Machine Elements, MEEN 3250 Computer Aided Design, and follows in the senior year with MEEN 4230-Machine Design. Students may take an elective course MEEN 4800-Advanced Machine Design with 100% design content and a

technical elective course MEEN 4100-Instrumentation and Automatic Controls or MEEN 4700-Mechanical Vibration.

The Thermal Design sequence builds on ENGR 2010-Thermodynamics, CVEN 3100-Fluid Mechanics with two senior level thermal design courses MEEN 4150-Heat Transfer, MEEN 4250-Thermal-Fluid Systems Design, and an elective course with 100% design content MEEN 4200-Heating and Air Conditioning.

The Mechanical Engineering Design requirement is completed with two semester capstone design courses ENGR 4500, 4510- Capstone Design I & II, which draw upon previous course work. An integral part of the design experience is the introduction of ethics, economics, social issues, and safety factors which are required to make a design successful. These concepts are introduced during the freshman year ENGR 1001, ENGR 1011-Introduction to Engineering I & II, and reinforced during the junior year. ENGR 3200- Introduction to Design is integrated into design projects in junior and senior level design courses. At each level, a formal written report and a formal oral presentation are required to communicate the design.

The Bachelor of Science degree program in Mechanical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC of ABET).

Degree Requirements For Bachelor of Science in Mechanical Engineering:

128 Semester Hours

Engineering Core:	91 semester hours
Major Core:	37 semester hours
Technical Electives:	Choose one from the following: MEEN 4100, 4120, 4300, 4400, 4600, 4700, EEEN 4020 or any other approved by the advisor and Department Head.
Design Electives:	Choose one from the following: MEEN 4200, 4800.

COURSE DESCRIPTIONS

ENGR 1001, ENGR 1011 Introduction to Engineering I and II (1-1). An overview of the College of Engineering and Technology, its academic support services, admission and retention standards, introduction to the engineering profession including engineering economics, probability and statistics, the programming and use of computers for word processing of technical report writing, spread sheets for data processing, and structured programming to aid scientific problem solving. Introduction to all departments including laboratory experiments. Completion of minor design project is required. Corequisite MATH

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ENGR 1151 Computer Engineering Graphics and Analysis (1). The course is designed to develop the fundamental skills of graphics communication by manual and computer means. Sketching techniques to develop orthographic and pictorial graphics skills, standard technical drawing methods, dimensioning techniques, working drawings development skills, and lettering capability will be the fundamental focus of the course. Corequisite ENGR 1001

ENGR 2000, ENGR 2001 Circuits I and Lab (3-1). Fundamental concepts of charge, current, voltage and power; passive and active circuit elements, phasors and impedance; mesh and nodal analysis; Thevenin's and Norton's Theorems; superposition; source transformations, natural and forced response of RL, RC, and RLC circuits average and effective values of periodic wave form; polyphase circuits. Prerequisites: ENGR 2211 or 2221 or 2231, MATH 2125, PHYS 2040.

ENGR 2010 Thermodynamics (4). An introduction to the nature and domain of thermodynamics; the Zeroth Law; properties and states of pure substances; work and heat; the First Law applied to both open and closed systems; general observations and statements of the Second Law; the inequality of Clausius and entropy changes for closed and open systems; vapor power and refrigeration cycles. Prerequisites: PHYS 2040, 2041, ENGR 2211 or 2221 or 2231.

ENGR 2110 Statics (4). Statics of particles; statics of rigid bodies in three dimensions; centroids and centers of gravity; friction and moment of inertia. Prerequisites: MATH 1925, PHYS 2030, 2031, ENGR 1001.

ENGR 2120 Dynamics (4). Study of the kinematics and kinematics of particles and rigid bodies; Principle of work and energy; Principle of impulse and momentum; Introduction to mechanical vibrations. Prerequisite: ENGR 2110 or 2130.

ENGR 2211 Engineering Computer Programming Laboratory (1). An introduction to the use of digital computers in the solution of engineering problems; included are familiarization with the architecture of a computer and the design and coding algorithms in one or more programming languages suitable to engineering. The course will include learning to write and read computer programs in the Fortran language. Prerequisite: MATH 1915, ENGR 1011.

ENGR 2221 Engineering Visual BASIC Programming Laboratory (1). An introduction to the use of digital computers in the solution of engineering problems; included are familiarization with the architecture of a computer and the design and coding algorithms in one or more programming languages suitable to engineering. The course will include learning to write and read computer programs in the Visual BASIC programming language. Prerequisite: MATH 1915,

ENGR 1011.

ENGR 2231 Engineering Visual C++ Programming Laboratory (1). An introduction to the use of digital computers in the solution of engineering problems; included are familiarization with the architecture of a computer and the design and coding of algorithms in one or more programming languages suitable for engineering. The course will include learning to write and read computer programs in the C++ language. Prerequisite: MATH 1915, ENGR 1011.

ENGR 2250 Transport Phenomena (4). Unified treatment of the principles of thermodynamics, heat transfer and fluid mechanics. Energy Analysis and the first and second law of thermodynamics. Steady state and transient heat conduction, convection and the thermal radiation process. Fundamentals of fluid flow. Prerequisites: PHYS 2040, 2041; ENGR 2211 or 2221 or 2231.

ENGR 3200 Introduction to Design (3). A course which considers the engineering design process as an interdisciplinary activity. Engineering Statistics, economic decision making and the design process are introduced as is oral and written technical reporting. A comprehensive design project is required as is a technical report and an oral report of the design. Prerequisites: ENGR 2000, 2010 (or ENGR 2250), 2120, 2211 or 2221 or 2231.

ENGR 3300 Materials Science (2). An introductory course on properties of materials, selection of materials, structure of crystalline and non-crystalline solids; mechanical behavior, electronics behavior, chemical behavior, stability and failure of materials Fundamentals of fluid flow. Prerequisites: CHEM 1010,. Prerequisites: PHYS 2020, 2021; ENGR 2211 or 2221 or 2231; MATH 1925, PHYS 2010.

ENGR 3400 Numerical Analysis (3). Numerical solution of the system of linear and non-linear equations; numerical differentiation and integration; numerical solution of ordinary and partial differential equations; curve fitting; regression analysis and probability. Prerequisites: MATH 3120, ENGR 2211 or 2221 or 2231. (Formerly ENGR 340).

ENGR 4110-A,B,C,D,E,F,G,H Special Topics in Engineering (3). Special subject presented to cover current problems of unique advances in the leading edge of techniques. Prerequisites: Senior standing and consent of instructor. (Formerly ENGR 411-A,B,C,D,E,F,G,H)

ENGR 4201 Engineer in Training Laboratory (1). A course designed to prepare students for the Fundamentals of Engineering Examination, a partial requirement for obtaining license as a professional engineer. This course is only offered during the fall semester. Prerequisite: Graduating Senior. (Formerly ENGR 420L)

ENGR 4230 Legal Ethical Aspects of Engineering (3). Legal principles underlying engineering work; laws of contracts, torts, agency, real property, problems of professional registration and ethics. (Formerly ENGR 423)

ENGR 4300 Engineering Economics (3). Economic factors involved in the acquisition and retirement of capital goods in engineering practice, including interest and capitalization methods of depreciation, amortization, sinking funds, cost and rate determination. Prerequisite: MATH 2125. (Formerly ENGR 430)

ENGR 4400 Probability and Statistics (3). Statistics and engineering; probability; probability distributions; Chebyshev's theorem; normal distribution; applications to operations research; treatment of data; hypothesis testing; method of least squares; regression; and application to engineering problems. Prerequisite: MATH 2125. (Formerly ENGR 440)

ENGR 4500 Capstone Design Project I (1). An engineering capstone design project I leading to completion of the project in ENGR 451. A written report and an oral defense of the proposed design project are required. Prerequisites: Graduating Senior, ENGR 3200. (Formerly ENGR 450)

ENGR 4510 Capstone Design Project II (1). A continuation of capstone design project I leading to completion of the project. A written report and an oral defense of the project are required. Prerequisite: ENGR 4500. (Formerly ENGR 451)

ENGR 4900 Professional Development Seminar (1). Discussion of case studies, professionalism, professional ethics, professional development activities required in industry. Prerequisite: Graduating Senior.

MEEN 3100 Materials Processing (2). Introduction to Manufacturing systems and the primary and secondary manufacturing processes. Prerequisite ENGR 3300, Co-requisite: MEEN 3511.

MEEN 3210 Mechanism Design (3). Analysis of mechanisms. A study of instantaneous centers, velocities, accelerations and forces in plane mechanisms by analytical and graphical methods. A study of cams and different gear trains. Design projects required. Prerequisite ENGR 2120.

MEEN 3220 Design of Machine Elements (3). A study of the fundamental principles which govern the design of machine elements. A study of design for strength, stiffness, wear and assembly. The design of screws, fasteners, welds, springs will be considered along with bearing selection and lubrication. Design projects required. Prerequisites: MEEN 3210, CVEN 3120.

MEEN 3250 Computer Aided Design (3). Introduction to software design and its application to engineering design. Computer aided design of curves and

surfaces. Computational techniques useful in design processes including simulation and optimization. Design projects required. Prerequisite: ENGR 3400.

MEEN 3511 Measurements and Instrumentation Laboratory (1). Use of basic instruments used in mechanical engineering. Measurement of basic physical properties including length, area, time, speed, mass, weight, inertia, temperature, humidity, pressure, viscosity, thermal conductivity etc. Calibration of instruments. Statistical and uncertainty analyses of data. Prerequisites: ENGR 2211 or 2221 or 2231. Co-requisite: ENGR 3200, MEEN 3100.

MEEN 3521 Manufacturing Processes Laboratory (1). Introduction to basic processing methods used to shape engineering materials. Use of lathes, milling, drilling, tapping, welding and casting. Basic testing of mechanical properties of materials. Prerequisite: ENGR 3300, Co-requisite: ENGR 3200, MEEN 3100.

MEEN 4011 Mechatronics Laboratory (1). Introduction to advanced instrumentations used by engineers including displacement, acceleration, and force transducers, strain gauges, thermocouples, oscilloscopes, and data acquisition systems. Behavior of zeroth, first, and second order systems. Measurement of vibration and sound. Prerequisites: ENGR 2000, 2001.

MEEN 4021 Thermal Fluid Systems Laboratory (1). Observation and analysis of common mechanical engineering systems. Hydraulic Pumps and Turbines. Pneumatic fans and blowers, internal combustion engines, refrigerators & heat pumps and solar energy system. Prerequisite: CVEN 3100.

MEEN 4100 Instrumentation and Automatic Control(s). Dynamic models and response of instruments and dynamic systems; transfer function and state space representation of mechanical, thermal, and electromechanical systems; time and frequency responses of systems; linear analysis of simple closed-loop systems; stability criteria; improvement of systems performance; and design of simple dynamic systems. Prerequisites: MATH 3120, ENGR 2000, 2001.

MEEN 4120 Mechanical Metallurgy (3). Introduction to various measures of strength. Topics include mechanical testing of poly-crystalline materials, plastic deformation of metals, and elementary geometry of dislocations. Prerequisites: ENGR 3300, CVEN 3120.

MEEN 4150 Heat Transfer (3). Introduction of heat transfer mechanisms: conduction heat transfer including steady state; one, two and three dimensional conduction and conduction in the unsteady state; convection heat transfer Including forced and free convection; radiation heat transfer; heat exchangers. Prerequisites: CVEN 3100, ENGR 3400.

MEEN 4200 Heating and Air Conditioning(s). Principles of heating, ventilating

and air conditioning systems, refrigeration cycles, refrigerant properties, heating and cooling loads, psychrometry; processes for heating, cooling, humidifying, dehumidifying, purifying; heat transfer principles and controls. Heat loss and gain computations. Design and layout of heating and air-conditioning systems. Design projects required. Co-requisite: MEEN 4150.

MEEN 4230 Machine Design (3). The design of machine parts including shafting, gears, brakes, clutches, flywheels and frames. Design projects required. Prerequisites: MEEN 3220, 3250.

MEEN 4250 Thermal Fluid Systems Design (3). Application of analytical techniques, the design of thermal devices, and thermal-fluids engineering systems. Design projects required. Prerequisite: MEEN 4150.

MEEN 4300 Mechanical Energy Conversion (3). Energy sources: solar, chemical, hydraulic and nuclear. Discussion of solar cells, fossil fuels, hydraulic turbines, fuel cells, thermionic generators, thermoelectric generators, MHD generators, fission reactors and the steam power plant. Prerequisites: ENGR 2010, CVEN 3100.

MEEN 4400 Manufacturing Engineering (3). Operating concepts and functions present in manufacturing. Topics include, industrial organization, process planning, specifications of designs of tools, jigs and fixtures, product quality control and automated production facilities. Case methods of instruction, which emphasize student participation in class discussion. Prerequisite: MEEN 3100.

MEEN 4600 Fluid Dynamics (3). Review of foundations of fluid dynamics and thermodynamics as related to control volumes; introduction to compressible flow; one-dimensional isentropic flow; normal shock waves; flow in constant area ducts with friction and flow in ducts with heating and cooling. Prerequisite: CVEN 3100.

MEEN 4700 Mechanical Vibration (3). Free and forced vibrations of systems with one and multi degrees of freedom. Modal analysis. Vibration measurement. Vibration of distributed systems. Passive and active vibration controls. Design considerations. Prerequisites: MATH 3120, ENGR 2120.

MEEN 4800 Advanced Machine Design (3). Function and application of analytic techniques as integrated in design procedures and design methodology. Advanced design topics in selected areas such as gears, lubrication and seals. A study of indeterminate structures and introduction to fracture mechanics. Design projects required. Prerequisite: MEEN 4230.

Undergraduate Courses in Mechanical Design Stem

ENGR 1151	COMPUTER ENGINEERING GRAPHICS
ENGR 2110	STATICS
ENGR 2120	DYNAMICS
ENGR 3200	INTRODUCTION TO DESIGN
ENGR 3300	MATERIALS SCIENCE
ENGR 4020	INTRODUCTION TO ROBOTICS (ELECTIVE)
ENGR 4500, 4510	CAPSTONE DESIGN PROJECT I & II
ENGR 4900	PROFESSIONAL DEVELOPMENT SEMINAR
MEEN 3211	MECHANISM DESIGN
MEEN 3220	DESIGN OF MACHINE ELEMENTS
MEEN 3250	COMPUTER AIDED DESIGN
MEEN 4100	DYNAMIC SYSTEMS AND CONTROL (ELECTIVE)
MEEN 4230	MACHINE DESIGN
MEEN 4700	MECHANICAL VIBRATION (ELECTIVE)
MEEN 4800	ADVANCED MACHINE DESIGN (ELECTIVE)
CVEN 3120, 3121	MECHANICS OF MATERIALS

Undergraduate Courses in Manufacturing Stem

ENGR 2110	STATICS
ENGR 2120	DYNAMICS
ENGR 3200	INTRODUCTION TO DESIGN
ENGR 3300	MATERIALS SCIENCE
ENGR 4500, 4510	CAPSTONE DESIGN PROJECT I & II
ENGR 4900	PROFESSIONAL DEVELOPMENT SEMINAR
MEEN 3100	MATERIALS PROCESSING
MEEN 3210	MECHANISM DESIGN
MEEN 3220	DESIGN OF MACHINE ELEMENTS
MEEN 3250	COMPUTER AIDED DESIGN
MEEN 3521	MANUFACTURING PROCESSES LABORATORY
MEEN 4011	MECHATRONICS LABORATORY
MEEN 4100	DYNAMIC SYSTEMS AND CONTROL (ELECTIVE)
MEEN 4230	MACHINE DESIGN
MEEN 4400	MANUFACTURING ENGINEERING (ELECTIVE)
MEEN 4700	VIBRATIONS (ELECTIVE)
MEEN 4800	MACHINE DESIGN - CASE STUDIES (ELECTIVE)
MEEN 4810	DESIGN FOR MANUFACTURABILITY (ELECTIVE)
CVEN 3120, 31211	MECHANICS OF MATERIALS

Undergraduate Courses in Thermal/Fluid Systems Stem

ENGR 2010	THERMODYNAMIC
ENGR 3200	INTRODUCTION TO DESIGN
ENGR 4500, 4510	CAPSTONE DESIGN PROJECT I & II
ENGR 4900	PROFESSIONAL DEVELOPMENT SEMINAR
MEEN 3250	COMPUTER AIDED DESIGN
MEEN 3511	MEASUREMENT AND INSTRUMENTATION LAB
MEEN 4011	MECHATRONICS LABORATORY
MEEN 4021	THERMAL-FLUID SYSTEMS LABORATORY
MEEN 4100	DYNAMIC SYSTEMS AND CONTROL (ELECTIVE)
MEEN 4150	HEAT TRANSFER
MEEN 4200	HEAT AND AIR CONDITIONING (DESIGN ELECTIVE)
MEEN 4250	THERMAL-FLUID SYSTEMS DESIGN
MEEN 4600	FLUID DYNAMICS (ELECTIVE)
CVEN 3100	FLUID MECHANICS

