ELECTRICAL ENGINEERING, BS

Program Description

Electrical Engineers develop electrical systems using knowledge of physics, mathematics, circuit design, electromagnetic theory, communication theory, control systems and signal processing. Electrical engineering historically involved how the generation, transmission and utilization of electrical energy. Today, electrical engineering applications also include control systems, robotics, automation, plasma, sensors, computers and imaging. The Bachelor of Science in Electrical Engineering (BSEE) program emphasizes service, systems-based knowledge, and sustainability with an eye toward the interface of traditional electrical engineering with new and emerging fields, in particular unmanned aircraft systems, maritime sciences and marine biology that directly impact the Gulf Coast.

Program Educational Objectives

The Program Educational Objectives (PEOs) describe the professional accomplishments that Electrical Engineering graduates are expected to achieve, within a few years of graduation. The PEOs are:

- Practice the electrical engineering discipline successfully within accepted professional standards.
- Continue to develop teamwork and communications skills to support a successful career in electrical engineering, including the ability to work with a diverse group of co-workers and others inside and outside the profession.
- Fulfill professional and ethical responsibilities in the practice of electrical engineering, including social, environmental and economic considerations.
- Engage in professional service, such as participation in professional society and community service.
- Engage in life-long learning activities, such as graduate studies or professional workshops, and develop mentee and mentor relationships.
- Become a leader of his/her chosen profession, including the assumption of management roles.
- Achieve recognition as a subject matter expert in electrical engineering, particularly by obtaining licensure as a professional engineer.

Student Learning Outcomes

Graduates will have:

1. an ability to apply knowledge of mathematics, science, and engineering
2. an ability to design and conduct experiments, as well as to analyze and interpret data
3. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. an ability to function on multidisciplinary teams
5. an ability to identify, formulate, and solve engineering problems
6. an understanding of professional and ethical responsibility
7. an ability to communicate effectively
8. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. a recognition of the need for, and an ability to engage in life-long learning
10. a knowledge of contemporary issues
11. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
12. an ability to analyze and design complex electrical and electronic devices, software and systems containing hardware and software components

Fundamentals of Engineering Exam

Students are encouraged to take the NCEES (National Council for Examiners for Engineering and Surveying) Fundamentals of Engineering (FE) exam (https://ncees.org/engineering/fe/) during their senior year. The FE exam is the first step in the process that leads to licensure as a Professional Engineer (P.E.).

Admission from pre-engineering

For all students admitted into a pre-engineering program at TAMU-CC who wish to transfer into one of the TAMU-CC engineering programs (CEEN, EEEN, IEEN, MEEN), the cumulative GPA for all MATH, CHEM, PHYS, ENGR, COSC, CEEN, EEEN, IEEN, or MEEN courses that appear in the CEEN, EEEN, IEEN, or MEEN program curricula, plus any ENTC courses, taken at TAMU-CC, or their equivalents taken at other institutions, should be 2.5 or greater to be admitted into the CEEN, EEEN, IEEN, or MEEN programs at TAMU-CC. There should be a minimum of at least 12 hours of such courses taken at TAMU-CC or elsewhere before a transfer / admission to CEEN, EEEN, IEEN, or MEEN may be considered. All such students must also meet the requirements to take MATH 2413 Calculus I (4 sch) if they have not already done so.

Master of Business Administration (MBA) Option

Electrical engineering students who have completed 96 credit hours toward the Electrical Engineering B.S. degree and earned a cumulative GPA of 3.0 or higher may elect the MBA option in senior year. Students who elect the MBA option are required to take three MBA foundation courses to satisfy the Technical Elective Block requirements:

Code	Title	Hours
ACCT 5312	Foundations of Accounting	3
ECON 5311	Foundations in Economics	3
FINA 5311	Financial Management Concepts	3

Students who plan to elect the MBA Option are encouraged to have summer internship experience before senior year, and will be able to complete an MBA degree study with 2 regular semesters and 1 summer session beyond an Electrical Engineering B.S. degree study.

General Requirements

The Electrical Engineering curriculum consists of a minimum of 128 credit hours. It can be divided into four main areas:

Requirements	Credit Hours
Core Curriculum Program (http://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/)	42
First-Year Seminars (when applicable)[1]	0-2
Common Engineering, Math and Science Courses	43
Required Electrical Engineering Courses	34
Technical Elective Block	9
Total Credit Hours	**128-130**

[1] Full-time, first time in college students are required to take the first-year seminars.
- UNIV 1101 First-Year Seminar I (1 sch)
- UNIV 1102 First-Year Seminar II (1 sch)

Transfer students with 24 or more hours are exempt from First-Year Seminar.

Program Requirements

Code	Title	Hours
Full-time, First-year Students		
UNIV 1101	First-Year Seminar I *	1
UNIV 1102	First-Year Seminar II *	1
Core Curriculum Program		
University Core Curriculum		42
Electrical Engineering students should take: [1]		
MATH 2413	Calculus I	
PHYS 2425	University Physics I	
PHYS 2426	University Physics II	
Common Engineering, Math and Science Courses		
CHEM 1411	General Chemistry I (included in University Core) *	
COSC 1320	C Programming	3
ENGR 1211	Introduction to Engineering	2
ENGR 2106	Digital Systems Laboratory	1
ENGR 2306	Digital Systems	3
ENGR 3316	Thermodynamics	3
ENGR 3322	Materials Science	3
ENGR 2325	Statics	3
ENGR 2460	Circuit Analysis	4
MATH 2305	Discrete Mathematics I	3
MATH 2413	Calculus I (included in University Core)	
MATH 2414	Calculus II	4
MATH 2415	Calculus III	4
MATH 3311	Linear Algebra	3
MATH 3315	Differential Equations	3
MATH 3345	Statistical Modeling and Data Analysis	3
PHYS 2425	University Physics I (included in University Core)	
PHYS 2426	University Physics II (included in University Core)	
Required Electrical Engineering Courses		
EEEN 3310	Electromagnetic Theory	3
EEEN 3315	Electrical Circuits II	3
EEEN 3320	Introduction to Communication Theory and Systems	3
EEEN 3330	Control Systems I	3
EEEN 3350	Electronic Systems Design	3
EEEN 3418	Microprocessors and Microcontrollers	4
EEEN 4310	Signal Processing	3
EEEN 4333	Machine Vision and Image Processing	3
ENGR 4240	Project Management	2
ENGR 4420	Engineering Lab Measurements	4
Technical Electives Block		
Students must complete 9 hours of elective courses. These may include upper-division Engineering and 4000-level Engineering Technology courses outside of the required courses in their degree plans, any 4000-level MATH, COSC, BIOL, CHEM, or PHYS courses, the specified courses in the 5-year BS/MBA program, and other courses approved by the Department of Engineering.		9
Capstone Project		
ENGR 4370	Capstone Projects	3
Total Hours		**129**

[1] Electrical Engineering students must take two courses in physics even if the natural science portion of the core curriculum is satisfied by other means. Students transferring to Texas A&M University - Corpus Christi from other institutions may have various means for fulfilling the core curriculum. Please refer to the "General Education Requirement" in the catalog section entitled "Undergraduate Programs (http://catalog.tamucc.edu/undergraduate/undergraduate-programs/)."

Capstone Project

All electrical engineering students must complete a senior-level capstone project in ENGR 4370 Capstone Projects (3 sch). Students will work with practicing engineers and mechanical engineering faculty. The Capstone Project will give engineering students practical, professional experience to prepare them for careers in electrical engineering.

Courses

Electrical Engineering Courses

EEEN 3310 Electromagnetic Theory
3 Semester Credit Hours (3 Lecture Hours)
AN INTRODUCTION TO THE THEORY OF STATIC AND DYNAMIC ELECTROMAGNETIC FIELDS WITH A FOCUS ON ENGINEERING APPLICATIONS. PRINCIPLES WILL BE ILLUSTRATED WITH APPLICATIONS IN VARIOUS AREAS. TOPICS INCLUDE COMPUTATIONAL ELECTROMAGNETICS, TRANSMISSION LINES, ANTENNAS, ELECTROMAGNETIC INTERFERENCE, AND SIGNAL PROPAGATION IN HIGH SPEED CIRCUITS.
Prerequisite: PHYS 2426, MATH 2415, 3315 and EEEN 3315.

EEEN 3315 Electrical Circuits II
3 Semester Credit Hours (3 Lecture Hours)
AC CIRCUIT ANALYSIS PRINCIPLES: AC GENERATION, PERIODIC FUNCTIONS, COMPLEX NUMBERS, PHASORS, IMPEDANCE AND ADMITTANCE, NETWORK THEOREMS, POWER, FREQUENCY RESPONSE, FILTERS, TRANSFORMERS, AND BALANCED THREE-PHASE SYSTEMS; AND USE OF ANALYSIS SOFTWARE.
Prerequisite: (ENGR 2305) or (ENGR 2460).

EEEN 3320 Introduction to Communication Theory and Systems
3 Semester Credit Hours (3 Lecture Hours)
FREQUENCY DOMAIN AND TIME DOMAIN RESPONSE OF LINEAR SYSTEMS; ANALOG MODULATION METHODS INCLUDING AMPLITUDE MODULATION, FREQUENCY MODULATION AND PHASE MODULATION; SIGNAL AND NOISE MODELING USING PROBABILISTIC DESCRIPTIONS; NARROWBAND RANDOM PROCESSES AND THE PERFORMANCE OF ANALOG MODULATION TECHNIQUES IN THE PRESENCE OF NOISE; DESIGN OF COMMUNICATION LINKS.
Prerequisite: (ENGR 2305 and 2105 or ENGR 2460) and MATH 3345.

EEEN 3330 Control Systems I
3 Semester Credit Hours (3 Lecture Hours)
INTRODUCTION TO CONTROL SYSTEMS; OPEN AND FEEDBACK; LAPLACE TRANSFORM AND FREQUENCY RESPONSE; CONTROL VALVES; ELECTRIC MOTORS; P, PI, AND PID MODES OF CONTROL; ANALOG AND DIGITAL CONTROLLERS PROCESS CHARACTERISTICS; ANALYSIS OF CONTROL SYSTEMS; GAIN AND PHASE MARGIN; STABILITY.
Prerequisite: (ENGR 2305 or 2460).

EEEN 3345 Electronic Devices and Circuits
3 Semester Credit Hours (3 Lecture Hours)
THE APPLICATIONS OF ELECTRONIC DEVICES, INCLUDING LINEAR AND NON-LINEAR OP-AMP CIRCUITS, OSCILLATORS, WAVE-SHAPING CIRCUITS, ACTIVE FILTERS, RECTIFIERS, VOLTAGE REGULATORS, AND POWER SUPPLIES; INDUSTRIAL ELECTRONICS.
Prerequisite: EEEN 3315.

EEEN 3350 Electronic Systems Design
3 Semester Credit Hours (3 Lecture Hours)
PRINCIPLES OF ENGINEERING DESIGN OF ELECTRONIC CIRCUITS AND SYSTEMS; TIME AND FREQUENCY RESPONSES; NETWORK ANALYSIS; SYSTEMS SPECIFICATIONS; EVALUATION, TESTING, AND VERIFICATION; USE OF ELECTRONIC DESIGN AUTOMATION TOOLS.
Prerequisite: (ENGR 2305 and 2306) or (ENGR 2460 and EEEN 3315).

EEEN 3418 Microprocessors and Microcontrollers
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
INTRODUCTION TO MICROPROCESSOR/MICROCONTROLLER ARCHITECTURE, ASSEMBLY LANGUAGE PROGRAMMING, AND INTERFACING. TOPICS INCLUDE COMPUTER ORGANIZATION, ADDRESSING MODES, INSTRUCTION SET, INTERRUPTS, TIMING, MEMORY, AND INTERFACING.
Prerequisite: COSC 1320 and (ENGR 2306 and 2106).
Co-requisite: SMTE 0099.

EEEN 4240 Project Management
2 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
FOUNDATIONS OF ENGINEERING ECONOMY, CASH FLOW AND EQUIVALENCE, AND PROJECT JUSTIFICATION. INTRODUCTION TO PROJECT MANAGEMENT, PLANNING, SCHEDULING, AND CONTROL, USE OF PROJECT MANAGEMENT SOFTWARE, GANTT CHARTS, PERT CHARTS, AND CRITICAL PATH. STUDENTS PREPARE PROPOSALS, INCLUDING SPECIFICATIONS, TIMELINES, SCHEDULE, AND BUDGET, FOR PROJECTS TO BE IMPLEMENTED IN EEEN 4370 - CAPSTONE PROJECTS.
Prerequisite: (EEEN 4370 and 3310EEEN 3350).

EEEN 4310 Signal Processing
3 Semester Credit Hours (3 Lecture Hours)
DISCRETE TIME SIGNALS & SYSTEMS, Z-TRANSFORM, DISCRETE FOURIER TRANSFORM, FLOW GRAPH AND MATRIX REPRESENTATION OF DIGITAL FILTERS, DIGITAL FILTER DESIGN TECHNIQUES AND COMPUTATION OF THE FAST FOURIER TRANSFORM (FFT). MATLAB SOFTWARE PACKAGE IS HEAVILY UTILIZED IN THIS COURSE.
Prerequisite: (EEEN 3320) and (EEEN 3330).

EEEN 4330 Introduction to Plasma Engineering and Applications
3 Semester Credit Hours (3 Lecture Hours)
PHYSICAL, ELECTRICAL, CHEMICAL PROPERTIES OF PLASMAS; DIFFERENCES IN PROPERTIES OF THERMAL AND NON-THERMAL PLASMAS, DIRECT AND ALTERNATING CURRENT PLASMA SOURCES, INDUCTIVE AND CAPACITIVE COUPLED PLASMA SOURCES, DIAGNOSTICS AND APPLICATIONS OF PLASMAS.
Prerequisite: (ENGR 3322 and 2460 or ENGR 2305 or PHYS 2426).

EEEN 4331 Power Transmission and Distribution
3 Semester Credit Hours (3 Lecture Hours)
THIS COURSE COVERS PRINCIPLES OF POWER TRANSMISSION AND DISTRIBUTION. TOPICS INCLUDE UNBALANCED DISTRIBUTION; POINT TO POINT MEASUREMENTS, OPERATION CONTROL OF SYSTEMS; POWER SYSTEMS; TRANSMISSION LINES; FAULT ANALYSIS; LINE MODELING AND UNIT ANALYSIS.
Prerequisite: EEEN 3315.

EEEN 4332 Power Protection Systems
3 Semester Credit Hours (3 Lecture Hours)
COURSE TOPICS INCLUDE SAFETY, RELIABILITY AND AVAILABILITY IN POWER SYSTEMS; BREAKER OPERATION; RELAY OPERATION AND RELAY CIRCUIT DESIGN; FAULT TOLERANCE; COST ANALYSIS; CONTROL SYSTEMS AND SYTEM SURVEILLANCE.
Prerequisite: EEEN 3315.

EEEN 4333 Machine Vision and Image Processing
3 Semester Credit Hours (3 Lecture Hours)
INTRODUCES STUDENTS TO AUTOMATED VISION SYSTEMS AND COMPONENTS, CAMERA MODELS, TESTING AND MEASUREMENT, AND FUNDAMENTALS OF IMAGE PROCESSING. TOPICS INCLUDE IMAGE ANALYSIS AND PROCESSING IN BINARY, GRAY SCALE AND COLOR IMAGES IN SPATIAL- AND FREQUENCY-DOMAIN. TEXTURE AND SHAPE ANALYSIS, HYPERSPECTRAL IMAGING, OTHER TRANSFORMS, AND FILTERS ARE DISCUSSED AND APPLIED.
Prerequisite: (COSC 1330, 1435, ENGR 2460 or 2305 and MATH 2414 and EEEN 4310).

EEEN 4334 Control Systems II
3 Semester Credit Hours (3 Lecture Hours, 1 Lab Hour)
MODEL IDENTIFICATION AND PARAMETER ESTIMATION (LEAST-SQUARE IDENTIFICATION OF AN AUTO-REGRESSIVE MODEL; NONPARAMETRIC IDENTIFICATION IN THE TIME DOMAIN; AND NONPARAMETRIC IDENTIFICATION IN THE FREQUENCY DOMAIN); ROBUST CONTROL (NYQUIST-PLOTS, SMALL-GAIN, AND PASSIVITY); OPTIMAL CONTROL (LQR/LQG FOR STATE-SPACE SYSTEMS AND TIME-OPTIMAL CONTROLLER FOR THE POSITIONING OF A MASS USING FORCE ACTUATION); NONLINEAR CONTROL (LYAPUNOV'S STABILITY METHOD; FEEDBACK LINEARIZATION CONTROLLER FOR A FULLY ACTUATED 2ND ORDER MECHANICAL SYSTEM; BACKSTEPPING FOR TRIANGULAR NONLINEAR SYSTEMS; ACTUATOR LIMITATIONS); WRITING AND PRESENTING REPORTS AND ANALYSIS.
Prerequisite: (EEEN 3330 or ENTC 4446).

EEEN 4345 Sensors and Systems
3 Semester Credit Hours (3 Lecture Hours)
(3:0) THIS COURSE INTRODUCES SENSORS AND SENSING SYSTEMS, AND THE ACQUISITION, PROCESSING, AND INTERPRETATION OF SIGNALS OBTAINED WITH SELECTED SENSORS AND SYSTEMS. THE COURSE WILL ALSO COVER SENSING MODALITIES, SIGNAL TRANSMISSION AND RECEPTION. MEASUREMENT AND UNCERTAINTY IN SENSORS AND SYSTEMS WILL BE DISCUSSED AS APPLIED TO SIGNAL NOISE AND INTERFERENCE. FILTERING AND ESTIMATION WILL BE INTRODUCED. SENSING SYSTEMS FOR VISION, MONITORING, AND CONTROL APPLICATIONS WILL BE SURVEYED. SENSOR INTERFACING, SIGNAL CONDITIONING AND TRANSFORMS WILL BE APPLIED. OTHER TOPICS INCLUDE MULTIDIMENSIONAL SIGNAL AND IMAGE PROCESSING, OBJECT TRACKING, MULTISENSOR DATA FUSION, APPLICATIONS IN ENVIRONMENTAL MONITORING, REMOTE SENSING AND SURVEILLANCE.
Prerequisite: (MATH 2414 and ENGR 2460).

EEEN 4370 Capstone Design
3 Semester Credit Hours (1 Lecture Hour, 5 Lab Hours)
THIS COURSE ALLOWS STUDENTS TO EMPLOY THE KNOWLEDGE ATTAINED IN OTHER COURSES TO IMPLEMENT (INCLUDING BUILDING, TESTING, AND DOCUMENTING) AN APPROVED PROJECT, WITHIN BUDGET AND ON SCHEDULE. COURSE REQUIREMENTS INCLUDE A WRITTEN REPORT AND ORAL PRESENTATIONS.
Prerequisite: (EEEN 4340).
Co-requisite: COMM 1315, EEEN 4333.

EEEN 4396 Directed Independent Study
1-3 Semester Credit Hours
(1-3) REQUIRES A FORMAL PROPOSAL OF STUDY TO BE COMPLETED IN ADVANCE OF REGISTRATION, APPROVAL OF SUPERVISING FACULTY AND DEPARTMENT CHAIRPERSON. PREREQUISITES: VARIES. OFFERED FALL, SPRING, AND SUMMER.

EEEN 4420 ENGINEERING MEASUREMENTS
4 Semester Credit Hours (2 Lecture Hours, 4 Lab Hours)
Prerequisite: ENGR 2460.
Co-requisite: SMTE 0099.

Engineering Courses

ENGR 1211 Introduction to Engineering
2 Semester Credit Hours (1 Lecture Hour, 2 Lab Hours)
INTRODUCTION TO THE ENGINEERING PROFESSION, ETHICS, AND DISCIPLINES; DEVELOPMENT OF SKILLS IN TEAMWORK, PROBLEM SOLVING AND DESIGN; OTHER TOPICS INCLUDE COMPUTER APPLICATIONS AND PROGRAMMING; VISUALIZATION, ORTHOGRAPHIC DRAWINGS AND CAD TOOLS; INTRODUCTION TO ELECTRICAL CIRCUITS, SEMICONDUCTOR DEVICES, DIGITAL LOGIC, COMMUNICATIONS AND THEIR APPLICATION IN SYSTEMS; NEWTON'S LAWS, UNIT CONVERSIONS, STATISTICS, EXCEL; BASIC GRAPHICS SKILLS. OFFERING: FALL AND SPRING.
Prerequisite: MATH 1314.
TCCNS: ENGR 1201

ENGR 1212 FOUNDATIONS OF ENGINEERING II
2 Semester Credit Hours (2 Lecture Hours)

ENGR 1312 Engineering Graphics I
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
TOPICS INCLUDE, DEPENDING ON THE MAJOR: EMPHASIS ON COMPUTER APPLICATIONS AND PROGRAMMING AND SOLIDS MODELING USING CAD TOOLS OR OTHER SOFTWARE; FUNDAMENTALS OF ENGINEERING SCIENCE; ADVANCED GRAPHIC SKILLS. OFFERED FALL AND SPRING.
TCCNS: ENGR 1304

ENGR 2105 Electrical Circuits Laboratory
1 Semester Credit Hour (3 Lab Hours)
LABORATORY EXPERIMENTS SUPPORTING THEORETICAL PRINCIPLES PRESENTED IN ENGR 2305 INVOLVING DC AND AC CIRCUIT THEORY, NETWORK THEOREMS, TIME, AND FREQUENCY DOMAIN CIRCUIT ANALYSIS. INTRODUCTION TO PRINCIPLES AND OPERATION OF BASIC LABORATORY EQUIPMENT; LABORATORY REPORT PREPARATION.
Prerequisite: ENGR 2305*.
* May be taken concurrently.
Co-requisite: ENGR 2305, SMTE 0099.

ENGR 2106 Digital Systems Laboratory
1 Semester Credit Hour (1 Lab Hour)
BASIC LABORATORY EXPERIMENTS SUPPORTING THEORETICAL PRINCIPLES PRESENTED IN ENGR 2306 INVOLVING DESIGN, CONSTRUCTION, AND ANALYSIS OF COMBINATIONAL AND SEQUENTIAL DIGITAL CIRCUITS AND SYSTEMS, INCLUDING LOGIC GATES, ADDERS, MULTIPLEXERS, ENCODERS, DECODERS, ARITHMETIC LOGIC UNITS, LATCHES, FLIP-FLOPS, REGISTERS, AND COUNTERS; PREPARATION OF LABORATORY REPORTS.
Prerequisite: MATH 1314.
Co-requisite: ENGR 2306, SMTE 0099.

ENGR 2305 Electrical Circuits
3 Semester Credit Hours (3 Lecture Hours)
PRINCIPLES OF ELECTRICAL CIRCUITS AND SYSTEMS. BASIC CIRCUIT ELEMENTS (RESISTANCE, INDUCTANCE, MUTUAL INDUCTANCE, CAPACITANCE, INDEPENDENT AND DEPENDENT CONTROLLED VOLTAGE, AND CURRENT SOURCES). TOPOLOGY OF ELECTRICAL NETWORKS; KIRCHHOFF 'S LAWS; NODE AND MESH ANALYSIS; DC CIRCUIT ANALYSIS; OPERATIONAL AMPLIFIERS; TRANSIENT AND SINUSOIDAL STEADY-STATE ANALYSIS; AC CIRCUIT ANALYSIS; FIRST- AND SECOND-ORDER CIRCUITS; BODE PLOTS; AND USE OF COMPUTER SIMULATION SOFTWARE TO SOLVE CIRCUIT PROBLEMS.
Prerequisite: (PHYS 2425 and MATH 2414).
Co-requisite: ENGR 2105.

ENGR 2306 Digital Systems
3 Semester Credit Hours (3 Lecture Hours)
INTRODUCTION TO THEORY AND DESIGN OF DIGITAL LOGIC, CIRCUITS, AND SYSTEMS. NUMBER SYSTEMS, OPERATIONS AND CODES; LOGIC GATES; BOOLEAN ALGEBRA AND LOGIC SIMPLIFICATION; KARNAUGH MAPS; COMBINATIONAL LOGIC; FUNCTIONS OF COMBINATIONAL LOGIC; FLIP-FLOPS AND RELATED DEVICES; COUNTERS; SHIFT REGISTERS; SEQUENTIAL LOGIC; MEMORY AND STORAGE.
Prerequisite: MATH 1314 and 2305*.
* May be taken concurrently.
Co-requisite: ENGR 2106.

ENGR 2320 STRENGTHS OF MATERIALS
3 Semester Credit Hours (3 Lecture Hours)
Concepts in strengths of materials, stress, strain; deformation under load, direct, sheer, and combined stresses concentrations, bending stresses and torsional sheer stresses, deflection in beams and shafts; columns, and pressure vessels.
Prerequisite: ENGR 2321.

ENGR 2325 Statics
3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
THEORY OF ENGINEERING MECHANICS INVOLVING FORCES, MOMENTS, AND COUPLES ON STATIONARY STRUCTURES; EQUILIBRIUM IN TWO AND THREE DIMENSIONS; FREE BODY DIAGRAMS; TRUSS ANALYSIS; FRICTION; CENTROIDS; CENTERS OF GRAVITY AND MOMENTS OF INERTIA.
Prerequisite: PHYS 2425 and MATH 2414*.
* May be taken concurrently.
TCCNS: ENGR 2301

ENGR 2326 Dynamics
3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
THEORY OF ENGINEERING MECHANICS INVOLVING THE MOTION OF PARTICLES, RIGID BODIES AND SYSTEMS OF PARTICLES; NEWTON'S LAWS; WORK AND ENERGY RELATIONSHIPS; PRINCIPLES OF IMPULSE AND MOMENTUM; APPLICATION OF KINETICS AND KINEMATICS TO THE SOLUTION OF ENGINEERING PROBLEMS.
TCCNS: ENGR 2302

ENGR 2350 MANUFACTURING PROCESSES
3 Semester Credit Hours (3 Lecture Hours)
Introduction to metal and non-metallic manufacturing processes; casting, forgoing, rolling, extrusion, sheet metal forming, cutting tools turing and milling operations, abrasive machining, welding and joining, powder compaction, molding, forming of plastics, surface treatment, human factors and safety.
Prerequisite: MATH 2414.

ENGR 2360 CIRCUIT ANALYSIS
3 Semester Credit Hours (3 Lecture Hours)
This course covers principles of electronics: charge, voltage, resistance, current, and power; Ohm's Law; Kirchoff's voltage and current laws; RC and LC circuits; periodic functions, average and RMS measurements; transformers, electrical measurement instruments. The laboratory provides hands-on experience with devices and circuits discussed in the classroom.
Prerequisite: PHYS 2426.

ENGR 2406 DIGITAL SYSTEMS
4 Semester Credit Hours (4 Lecture Hours)
Prerequisite: (COSC 1330 or 1435) and (ENGR 2460 and MATH 2414).
Co-requisite: SMTE 0099.

ENGR 2460 Circuit Analysis
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
THIS COURSE COVERS PRINCIPLES OF ELECTRONICS: CHARGE, VOLTAGE, RESISTANCE, CURRENT, AND POWER; OHM'S LAW; KIRCHHOFF'S VOLTAGE AND CURRENT LAWS; RC AND LC CIRCUITS; PERIODIC FUNCTIONS, AVERAGE AND RMS MEASUREMENTS; TRANSFORMERS, ELECTRICAL MEASUREMENT INSTRUMENTS. THE LABORATORY PROVIDES HANDS-ON EXPERIENCE WITH DEVICES AND CIRCUITS DISCUSSED IN THE CLASSROOM.
Prerequisite: (PHYS 2426, MATH 2414 and 3315*).
* May be taken concurrently.
Co-requisite: SMTE 0099.
TCCNS: ENGR 2305

ENGR 3315 Fluid Mechanics
3 Semester Credit Hours (3 Lecture Hours)
FLUID PROPERTIES, FLUID STATICS, DYNAMICS, AND KINEMATICS, CONSERVATION OF ENERGY AND MOMENTUM INCOMPRESSIBLE, LAMINAR AND TURBULENT FLOW. SIMILITUDE AND DIMENSIONAL ANALYSIS, AND VISCOUS FLOW.
Prerequisite: MATH 3315 or 3315 and ENGR 2326 and MATH 2415.

ENGR 3316 Thermodynamics
3 Semester Credit Hours (3 Lecture Hours)
THEORY AND APPLICATION OF ENERGY METHODS IN ENGINEERING; CONSERVATION OF MASS AND ENERGY; ENERGY TRANSFER BY HEAT, WORK AND MASS; THERMODYNAMIC PROPERTIES; ANALYSIS OF OPEN AND CLOSED SYSTEMS; THE SECOND LAW OF THERMODYNAMICS AND ENTROPY; GAS, VAPOR AND REFRIGERATION CYCLES.
Prerequisite: (PHYS 2425 and MATH 2414).

ENGR 3320 Strength of Materials
3 Semester Credit Hours (3 Lecture Hours)
CONCEPTS IN STRENGTH OF MATERIALS, STRESS, STRAIN; DEFORMATION UNDER LOAD, DIRECT, SHEAR, AND COMBINED STRESSES; STRESS CONCENTRATIONS, BENDING STRESSES AND TORSIONAL SHEAR STRESSES, DEFLECTION IN BEAMS AND SHAFTS; COLUMNS, AND PRESSURE VESSELS.
Prerequisite: ENGR 2325 and 3322 or ENGR 2322.

ENGR 3322 Materials Science
3 Semester Credit Hours (3 Lecture Hours)
STRUCTURE AND PROPERTIES OF METALLIC AND NONMETALLIC MATERIALS; MICROSTRUCTURE, MECHANICAL TESTING, PHASE DIAGRAMS, HEAT TREATMENT, TESTING, CERAMICS, POLYMERS, COMPOSITES, CONSTRUCTION MATERIALS, FAILURE ANALYSIS, NONDESTRUCTIVE EVALUATION, CORROSION AND THERMAL PROPERTIES OF MATERIALS.
Prerequisite: (CHEM 1411) and (PHYS 2425).
Co-requisite: SMTE 0099.

ENGR 3350 Manufacturing Processes
3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
INTRODUCTION TO METAL AND NON-METALLIC MANUFACTURING PROCESSES; CASTING, FORGING, ROLLING, EXTRUSION, SHEET METAL FORMING, CUTTING TOOLS TURNING AND MILLING OPERATIONS, ABRASIVE MACHINING, WELDING AND JOINING, POWDER COMPACTION, MOLDING, FORMING OF PLASTICS, SURFACE TREATMENT, HUMAN FACTORS AND SAFETY.
Prerequisite: ENGR 1312, 3320 and 2326.
Co-requisite: SMTE 0099.

ENGR 4240 Project Management
2 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
FOUNDATIONS OF ENGINEERING ECONOMY, CASH FLOW AND EQUIVALENCE, AND PROJECT JUSTIFICATION. INTRODUCTION TO PROJECT MANAGEMENT, PLANNING, SCHEDULING, AND CONTROL, USE OF PROJECT MANAGEMENT SOFTWARE, GANTT CHARTS, PERT CHARTS, AND CRITICAL PATH. STUDENTS PREPARE PROPOSALS, INCLUDING SPECIFICATIONS, TIMELINES, SCHEDULE, AND BUDGET, FOR PROJECTS TO BE IMPLEMENTED IN ENGR 4370 - CAPSTONE PROJECTS. THIS COURSE SHOULD BE TAKEN THE SEMESTER PRECEDING ENGR 4370 - CAPSTONE PROJECTS.
Prerequisite: (MEEN 3330) and (MEEN 3345) or (EEEN 3330) or (EEEN 3310) and (EEEN 3350).
Co-requisite: SMTE 0099.

ENGR 4350 Machine Vision and Image Processing Applications
3 Semester Credit Hours (3 Lecture Hours)
INTRODUCES STUDENTS TO AUTOMATED VISION SYSTEMS AND COMPONENTS, CAMERA MODELS, TESTING AND MEASUREMENT, AND FUNDAMENTALS OF IMAGE PROCESSING. TOPICS INCLUDE IMAGE ANALYSIS AND PROCESSING IN BINARY, GRAY SCALE AND COLOR IMAGES IN SPATIAL- AND FREQUENCY-DOMAIN. TEXTURE AND SHAPE ANALYSIS, HYPERSPECTRAL IMAGING, OTHER TRANSFORMS, AND FILTERS ARE DISCUSSED AND APPLIED.
Prerequisite: (COSC 1330 or 1435) and ENGR 2460 and MATH 2414.

ENGR 4370 Capstone Projects
3 Semester Credit Hours (1 Lecture Hour, 5 Lab Hours)
THIS COURSE ALLOWS STUDENTS TO EMPLOY THE KNOWLEDGE ATTAINED IN OTHER COURSES TO IMPLEMENT (INCLUDING BUILDING, TESTING, AND DOCUMENTING) AN APPROVED PROJECT, WITHIN BUDGET AND ON SCHEDULE. COURSE REQUIREMENTS INCLUDE A WRITTEN REPORT AND ORAL PRESENTATIONS.
Prerequisite: (ENGR 4240) and (MEEN 4360*) and (MEEN 4365*) or (EEEN 4333*, CEEN 4304* or IEEN 4310*).
* May be taken concurrently.
Co-requisite: SMTE 0099.

ENGR 4390 Special Topics in Engineering
1,3 Semester Credit Hours (1,3 Lecture Hours)
SUBJECT MATERIAL VARIABLE. MAY BE REPEATED FOR CREDIT WHEN TOPICS ARE DIFFERENT.

ENGR 4420 Engineering Lab Measurements
4 Semester Credit Hours (2 Lecture Hours, 4 Lab Hours)
PRINCIPLES OF PHYSICAL MEASUREMENTS; STANDARDS, CALIBRATION, ERROR ESTIMATION; STATIC AND DYNAMIC PERFORMANCE OF MEASURING SYSTEMS; LABORATORY EXPERIENCE, EXPERIMENT PLANNING, REPORT WRITING. THE PURPOSE OF THIS COURSE IS FOR STUDENTS TO GAIN PROFICIENCY IN DESIGNING, ASSEMBLING, AND OPERATING AN EXPERIMENT; AND ANALYZING AND PRESENTING EXPERIMENTAL RESULTS. THIS ENCOMPASSES SKILLS SUCH AS AN UNDERSTANDING CONTROL AND DATA ACQUISITION ELECTRONICS, OPERATION AND LIMITATION OF MODERN SENSORS, CALIBRATION AND ERROR ANALYSIS, ASSESSING APPLICABILITY OF THEORY AND THE IMPACT OF SECONDARY EXPERIMENTAL VARIABLES, AND WRITING AND PRESENTING REPORTS AND ANALYSIS. OFFERED FALL AND SPRING.
Prerequisite: ENGR 2460.
Co-requisite: SMTE 0099.

ENGR 4444 Engineering Measurements
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
A VERY SIGNIFICANT PART OF DESIGNING ELECTRONIC INSTRUMENTS INVOLVES SELECTING THE APPROPRIATE PHYSICAL DEVICES TO TRANSLATE QUANTITIES TO BE MEASURED INTO VOLTAGES OR CURRENTS THAT CAN BE SENSED WITH ELECTRONIC CIRCUITS. THE RANGE OF SENSORS AND TRANSDUCERS AVAILABLE WILL BE STUDIED WITH EXAMPLES FROM INDUSTRY AND MEDICAL INSTRUMENTATION. THE COURSE WILL EXPLORE IN SOME DETAIL THE USE OF ANALOG TO DIGITAL (A/D) AND DIGITAL TO ANALOG (D/A) CONVERTERS AND THEIR APPLICATIONS. STUDENTS WILL ALSO LEARN TO USE COMPLETE A/D-MICROPROCESSOR-D/A SYSTEMS SINCE THESE ARE PART OF NEARLY ALL INSTRUMENTS NOW. IN THIS COURSE STUDENTS WILL LEARN TO BUILD A COMPLETE INSTRUMENT BY COMBINING ANALOG AND DIGITAL COMPONENTS AND USING ADVANCED ALGORITHMS. WE WILL REVIEW THE BASIC CONCEPTS FROM ANALOG ELECTRONICS AND REAL-TIME EVENT DRIVEN PROGRAMMING ONE NEEDS TO UNDERSTAND IN ORDER TO CONSTRUCT SUCH INSTRUMENTS AND EXPERIMENT THROUGH A SERIES OF LABS.
Prerequisite: (EEEN 2306 and 3315).
Co-requisite: SMTE 0099.