

# ENGINEERING (ENGR)

## 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 shear 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, 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:** 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<sup>\*</sup>).

<sup>\*</sup> 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<sup>\*</sup>) and (MEEN 4365<sup>\*</sup>) or (EEEN 4333<sup>\*</sup>, CEEN 4304<sup>\*</sup> or IEEN 4310<sup>\*</sup>).

<sup>\*</sup> 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.