

DEPARTMENT OF ENGINEERING AND TECHNOLOGY

Chairperson: Nasser Ghariban

Location: Engineering and Technology Building, Room 301

Contact Information: (804) 524-1105 | nghariban@vsu.edu

Department Overview

The Department of Engineering offers three undergraduate degrees: **Bachelor of Science (B.S.) in Computer Engineering**, **Bachelor of Science (B.S.) in Manufacturing Engineering**, and **Bachelor of Science (B.S.) in Mechanical Engineering**. The department also offers graduate level degree: **Master of Science in Data Analytics** (refer to the Graduate Catalog for more information).

Mission Statement

The mission of the Department of Engineering is to provide excellent education and research opportunities to a diverse student body in order to prepare them for productive careers at industrial, governmental, and academic settings in the rapidly evolving fields of science and engineering.

Student Organizations

- American Society of Mechanical Engineers (ASME)
- Institute of Electrical and Electronics Engineers (IEEE)
- Society of Manufacturing Engineers (SME)
- National Society of Black Engineers (NSBE)
- Society of Women Engineers (SWE)

Accreditation Information

The Computer Engineering (Bachelor of Science) program is accredited by the Engineering Accreditation Commission of ABET (<http://catalog.vsu.edu/undergraduate/college-engineering-technology/departments-engineering-computer-science/www.abet.org>), under the commission's General Criteria and Program Criteria for Electrical, Computer, Communications, Telecommunication(s), and Similarly Named Engineering Programs. The Manufacturing Engineering (Bachelor of Science) program is accredited by the Engineering Accreditation Commission of ABET (<http://catalog.vsu.edu/undergraduate/college-engineering-technology/departments-engineering-computer-science/www.abet.org>), under the commission's General Criteria and Program Criteria for Manufacturing and Similarly Named Engineering Programs. ABET (<http://catalog.vsu.edu/undergraduate/college-engineering-technology/departments-engineering-computer-science/www.abet.org>) requires that the programs have published Program Educational

Objectives (PEOs) that are consistent with the Institution's mission, the various constituencies' needs, and other ABET (<http://catalog.vsu.edu/undergraduate/college-engineering-technology/departments-engineering-computer-science/www.abet.org>) criteria. It also requires that each program has documented and publicly stated Student Outcomes (SOs) that minimally include those defined by the organization.

According to ABET (<http://catalog.vsu.edu/undergraduate/college-engineering-technology/departments-engineering-computer-science/www.abet.org>), "Program Educational Objectives are broad statements that describe what graduates are expected to attain within a few years of graduation. Student Outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program."

Department Goals

The **Computer Engineering Program Educational Objectives** are as follows:

- Advance in their profession as globally competitive leaders in their selected career field.
- Practice the profession ethically and responsibly throughout their careers, and contribute to the welfare of local, national, and global communities.
- Present and produce documents or media to enhance individual and organizational productivity.
- Engage in professional development throughout their careers to broaden their knowledge for significant contributions to technological innovation.

The **Manufacturing Engineering Program Educational Objectives** are as follows:

- Advance in their profession as globally competitive leaders in their selected career field.
- Practice the profession ethically and responsibly throughout their careers, and contribute to the welfare of local, national, and global communities.
- Present and produce papers or media to enhance individual and organizational productivity.
- Engage in professional development throughout their careers to broaden their knowledge for significant contributions to technological innovation.

The **Mechanical Engineering Program Educational Objectives** are as follows:

- Advance in their profession as globally competitive leaders in their selected career field.
- Practice the profession ethically and responsibly throughout their careers, and contribute to the welfare of local, national, and global communities.
- Present and produce papers or media to enhance individual and organizational productivity.
- Engage in professional development throughout their careers to broaden their knowledge for significant contributions to technological innovation.

Program Listings

Bachelor of Science (B.S.) in Computer Engineering

Computer engineers design computer based real-time data acquisition systems. They analyze and design of computer hardware and software systems and consider tradeoffs. In addition, computer engineers are used in an ever-growing number of positions involved with the applications of computers and digital technology. Our program prepares students by providing a strong background in mathematics, statistics, sciences and engineering, with emphasis in computer hardware, software, interfacing, and design. It also grants elective flexibility for specialization in all aspects of computer engineering and related areas. In addition, our students participate in undergraduate research, summer internships, professional societies, and leadership skills development.

The Student Outcomes for the Computer Engineering program are as follows:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Bachelor of Science (B.S.) in Manufacturing Engineering

Manufacturing engineers plan, direct, and coordinate new products from the design stage to the production and delivery to customers. Our program prepares students with a strong technical foundation in conventional manufacturing engineering and provides them with the tools to face the challenges of globalized marketplaces, and ecologically conscious and interdisciplinary business environments. Our curriculum is developed to provide a balanced knowledge of product design; materials; manufacturing processes; manufacturing systems; manufacturing automation and robotics; quality assurance; and project management. Students experience hands-on activities in our advanced laboratories. Besides laboratory experiences, we offer our students a rich educational experience in interdisciplinary research through senior projects, manufacturing design implementation, extracurricular activities, and interaction with our exceptional faculty at the forefront of their fields.

The Student Outcomes for the Manufacturing Engineering program are as follows:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Bachelor of Science (B.S.) in Mechanical Engineering

Mechanical engineering is a diverse subject that takes a product from an idea to the marketplace. In order to accomplish this, the mechanical engineer needs to acquire particular skills and knowledge. The most common skill in the mechanical engineer's exclusive domain is the ability to analyze and design objects and systems with motion. They use basic science and mathematics to design complex engineering systems, which requires the application of physical and mechanical principles to the development of machines, energy conversion systems, materials and equipment for guidance and control.

The mechanical engineering curriculum is based on a common core of engineering courses taken in the first two years. Students spend their third and fourth studying fundamental courses in controls and systems analysis, fluid mechanics, heat transfer, mechanical design and thermodynamics. This curriculum students to play key roles in a wide range of industries including automotive, aerospace, biotechnology, computers, electronics, microelectromechanical systems, energy conversion, robotics and automation, and manufacturing.

The Student Outcomes for the Mechanical Engineering program are as follows:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Major(s)

- Computer Engineering, Bachelor of Science (B.S.) (<http://catalog.vsu.edu/undergraduate/college-engineering-technology/department-engineering-computer-science/computer-engineering-major-bs/>)
- Manufacturing Engineering, Bachelor of Science (B.S.) (<http://catalog.vsu.edu/undergraduate/college-engineering-technology/department-engineering-computer-science/manufacturing-engineering-major-bs/>)
- Mechanical Engineering, Bachelor of Science (B.S.) (<http://catalog.vsu.edu/undergraduate/college-engineering-technology/department-engineering-computer-science/mechanical-engineering-major-bs/>)

CPEG (p.), ENGR (p.), MANE (p.), CSCI (p.)

COURSE DESCRIPTION COMPUTER ENGINEERING

CPEG 207 INTRODUCTION TO DIGITAL SYSTEMS - 3 semester hours

Boolean algebra and logic design of combinational and sequential circuits. Gate and flip-flop characteristics for TTL technology adders, multipliers, register transfer language, general-purpose processor design, basic computer organization, machine level programming, relationships between software and hardware.

Prerequisite: ENGR 102

Co-requisite: CPEG 227

CPEG 208 MICROPROCESSORS - 3 semester hours

Principles of operation of 80x86 family of microprocessors, including assembly language programming, internal architecture of 80x86 processors, timing analysis, and interfacing techniques. Special emphasis will be placed on hardware-software interactions, design of memory systems for microprocessors, and on utilization of programmable peripheral devices.

Prerequisite: CPEG 207

Co-requisite: CPEG 228

CPEG 227 DIGITAL SYSTEMS LABORATORY - 1 semester hour

Design and implement digital systems. Build combinational and sequential logic circuits. Measure/ troubleshoot the logic circuits using general electronic test equipment. Reinforce the concepts learned in CPEG 207 Introduction to Digital Systems.

Co-requisite: CPEG 207

CPEG 228 MICROPROCESSORS LABORATORY - 1 semester hour

Microprocessor-based laboratory utilizing computer programming language. Emphasis is on writing and running programs on the 8088/86 based microprocessor systems. Lab includes both software and hardware.

Co-requisite: CPEG 208

CPEG 303 INTRODUCTION TO ELECTRONICS - 3 semester hours

Basic semiconductor physics, theory of p-n junctions; diodes, field effect transistors, and bipolar transistors; modeling of diode and transistor devices; analysis and design of diode switching and rectifier circuits; basic transistor switching circuits and single stage amplifiers; multistage

transistor amplifier biasing; op amps, and output stages; electronic simulation using PSPICE.

Prerequisite: ENGR 201 and PHYS 113

Co-requisite: CPEG 323, CHEM 151

CPEG 305 OPERATING SYSTEMS - 3 semester hours

Functions and components of an operating system, including process synchronization, job scheduling, memory management, file systems protection, and deadlocks. Related system software, such as loaders, linkers, assemblers, and windowing systems.

Prerequisite: ENGR 203

CPEG 307 LINEAR SYSTEM ANALYSIS - 3 semester hours

Transient response of linear time-invariant, continuous-time and discrete-time dynamic systems by various methods including Laplace transform, and z-transform; properties of sampling; input-output characteristics; frequency response analysis.

Prerequisite: ENGR 201

Co-requisite: MATH 350

CPEG 308 ANALOG COMMUNICATION - 3 semester hours

Filter design, noise, signal-to-noise ratio, amplitude modulation, frequency modulation.

Prerequisites: CPEG 303 and PHYS 113

CPEG 309 ADVANCED DIGITAL SYSTEM DESIGN - 3 semester hours

Design of digital systems using programmable logic devices and high-level design techniques. Emphasizes the application of state-of-the-art hardware devices as well as design and simulation tools.

Prerequisite: CPEG 207

Co-requisite: CPEG 329

CPEG 323 INTRODUCTION TO ELECTRONICS LABORATORY - 1 semester hour

Prototype bread-board electronic circuits using diodes, bipolar junction transistors, MOSFETS with DC biasing configurations and with superimposition of AC signals. Operational and differential amplifier and active filter circuits.

Co-requisite: CPEG 303

CPEG 329 ADVANCED DIGITAL SYSTEM DESIGN LABORATORY - 1 semester hour

System design using programmable logic devices and high-level design techniques. Application of state-of-the-art hardware devices as well as design and simulation tools.

Co-requisite: CPEG 309

CPEG 403 ENGINEERING COMPUTATIONS - 3 semester hours

Linear algebra, complex analysis and phasor calculus; algorithms for roots of equations. Programming in C and use of the application language, such as, MATLAB.

Prerequisite: Senior standing

CPEG 404 REAL-TIME DATA ACQUISITION AND CONTROL SYSTEM - 3 semester hours

Advanced course in design of microcomputer-based systems. Emphasis is on the application of state-of-the-art microprocessors, microcomputers for data collection using A/D converters; D/A converter. Includes Laboratory.

Prerequisite: Senior standing

CPEG 407 LINEAR CONTROL SYSTEM DESIGN - 3 semester hours

Classical and modern techniques for design and compensation of linear feedback control systems. Includes Bode design, root locus design, state variable pole placement design.

Prerequisites: CPEG 307 and PHYS 112

CPEG 410 DIGITAL COMMUNICATION - 3 semester hours

Discrete Fourier Transforms. Binary and M-ary Signaling, Digital Communication in the Presence of Noise, Matched Filtering and Equalization, Introduction to Information Theory.

Prerequisites: CPEG 307 and CPEG 308

CPEG 411 COMMUNICATION SYSTEM DESIGN - 3 semester hours

Application of communication theory to system design. Development of communication system specifications. System simulation utilizing a graphical programming language. Hardware and software design and simulation. Design of a complete analog or digital transmitter and receiver or significant subsystems.

Prerequisite: CPEG 410

CPEG 412 ORGANIZATION AND DESIGN OF DIGITAL SYSTEMS AND COMPUTERS - 3 semester hours

Considerations for hardware organization of computer and digital systems; includes ALU and CPU structures, control unit organization, storage systems, and the I/O channels. Microprogramming the control unit and different interrupt structures.

Prerequisite: CPEG 208

CPEG 413 DIGITAL SIGNAL PROCESSING AND FILTER DESIGN - 3 semester hours

Discrete-time signals and systems, sampling, discrete Fourier transforms, analog filter characteristics, non-recursive and recursive filter design, and CAD tools for filter design.

Prerequisite: CPEG 307

Co-requisite: CPEG 423

CPEG 414 INTRODUCTION TO PATTERN RECOGNITION - 3 semester hours

Design of learning and adaptive machines. Elementary decision theory, perception algorithm, Bayes Classification rule, learning algorithms, elements of syntactic pattern recognition, adaptive classifiers.

Prerequisite: Senior standing in CPEG. Non majors require consent of instructor.

CPEG 415 INTRODUCTION TO DIGITAL IMAGE PROCESSING - 3 semester hours

Basic methods for digitizing, storing, processing, and displaying images. Computational procedures for image enhancement, restoration, coding, and segmentation.

Prerequisite: Senior standing in CPEG. Non majors require consent of instructor.

CPEG 416 EMBEDDED CONTROLLERS - 3 semester hours

Project oriented course in development system with cross-compilers and emulation capability. Interfacing and hardware/software tradeoffs in interrupt driver applications.

Prerequisite: CPEG 208

Co-requisite: CPEG 426

CPEG 420 NANOTECHNOLOGY FABRICATION PRINCIPLES - 3 semester hours

Introduction to semiconductor fabrication principles and technology, including crystal growth, oxidation, diffusion, ion implantation, photolithography, chemical vapor deposition, physical vapor deposition,

plasma reactive ion etching, chemical mechanical polishing and other nanotechnology manufacturing techniques.

CPEG 422 ADVANCED INTEGRATED CIRCUIT DESIGN - 3 semester hours

Advanced designed topics will be addressed, including digital design circuits, propagation delay, noise margins, power dissipation, various design styles and architectures as well as the issues that designers must face, such as the influence of technology scaling on circuit performance and the impact of interconnect parasitic for optimizing the speed, area or power. CAD Tools for layout, extraction and simulation will be used for assignments.

CPEG 423 DIGITAL SIGNAL PROCESSING AND FILTER DESIGN LAB - 1 semester hour

Implement digital signal processing algorithms including: sampling, digital filtering, and simulation. Develop and test Finite Impulse Response (FIR) filters, Infinite Impulse Response (IIR) filters, and Digital Signal Processor (DSP) applications on DSP microprocessors. Reinforce the concepts learned in CPEG 413 Digital Signal Processing and Filter Design.

Co-requisite: CPEG 413

CPEG 426 EMBEDDED CONTROLLERS LAB - 1 semester hour

Project oriented laboratory course in the areas on microprocessor based systems and micro-controllers.

Prerequisite: CPEG 208

Co-requisite: CPEG 416

CPEG 461 SENIOR DESIGN I - 2 semester hour (3 contact hours)

Capstone design projects that focus on the early stages of project development: design methodology, literature review, specifications development, design alternatives, project plan, and project management. Written and oral communications. Team building. Ethics and professionalism.

Prerequisite: Graduating Senior standing

CPEG 462 SENIOR DESIGN II - 2 semester hour (3 contact hours)

Hardware and Software implementation of the capstone design projects proposed in CPEG 461 SENIOR DESIGN I. Design prototyping, testing, evaluation, project reports and project presentation.

Prerequisite: CPEG 461

CPEG 499 SPECIAL TOPICS - 1 to 3 semester hours

Topics relating to basic design and current practice. Maximum three hours.

Prerequisite: Completion of all junior CPEG courses or consent of instructor

ENGINEERING

ENGR 101 INTRODUCTION TO ENGINEERING I - 2 semester hours

Introduction to the engineering profession, Introduction to problem solving using analytical, graphical, and computer tools including scientific word processors, spreadsheets and database packages, mathematical computation software. Introduction to logic. Engineering ethics and professional responsibilities. This course includes lab sessions.

ENGR 102 INTRODUCTION TO ENGINEERING II - 2 semester hours

Introduction to problem solving using analytical, graphical, and computer tools including scientific word processors, spreadsheets and database packages, mathematical computation software.

Introduction to engineering analyses. Engineering ethics and professional responsibilities. This course includes lab sessions.

Prerequisite: ENGR 101

ENGR 200 ENGINEERING GRAPHICS (Lab included) - 3 semester hour

Freehand sketching, lettering scales, use of instruments, layout drawings, orthogonal projection, descriptive geometry, pictorials, and basic dimensioning. Technical communication in design, engineering, and manufacturing. Introduction to computer-aided design and drafting, Introduction to solid modeling.

ENGR 201 CIRCUIT ANALYSIS - 3 semester hours

Fundamentals laws of circuit analysis. Ohm's Law, Kirchhoff's current and voltage laws, the law of conservation of energy, circuits containing independent and dependent voltage and current sources, resistance, conductance, capacitance and inductance analyzed using mesh and nodal analysis, superposition and source transformations, and Norton's and Thevenin's Theorems. Steady state analysis of DC and AC circuits. Complete solution for transient analysis for circuits with one and two storage elements.

Prerequisite: MATH 260

Co-requisite: ENGR 221

ENGR 203 INTRODUCTION TO PROGRAMMING - 3 semester hours

An introduction to the computer, to the algorithmic process, and to programming in C using standard control structures. Windows and UNIX operating systems are used.

Prerequisite: ENGR 101

ENGR 204 INTRODUCTION TO OBJECT ORIENTED PROGRAMMING - 3 semester hours

Advanced program design and implementation in the Java programming language. Object-oriented programming with concepts including class structure and behavior, objects, inheritance and reuse, virtual functions and polymorphism, exception handling, templates, and the Standard Template Library. The Windows and/or UNIX operating is used.

Prerequisite: ENGR 203

ENGR 210 STATICS AND STRENGTH OF MATERIALS - 3 semester hours

The first part of this course covers the application of the principles of engineering mechanics to problems involving equilibrium of particles and solids. Topics include resultants, equilibrium, friction, trusses, center of gravity and moments of inertia. The second part of this course introduces the principles of mechanics necessary for the solution of engineering problems relating to strength, stiffness and material selection. Topics covered include stress, strain, torsion, beams, columns and combined stresses at a point.

Prerequisite: ENGR 101

Co-requisite: MATH 261

ENGR 221 ANALOG CIRCUITS LABORATORY - 1 semester hour

Measurement techniques and experiments on fundamental laws. Circuit analysis techniques including: Ohm's Law, Kirchhoff's current and voltage laws, the law of conservation of energy, Norton's and Thevenin's Theorems, mesh and nodal analysis, superposition, and source transformations. Reinforce the concepts learned in ENGR 201 Circuit Analysis.

Co-requisite: ENGR 201

ENGR 301 ENGINEERING STATISTICS - 3 semester hours

Engineering applications of the concepts of probability, statistical distributions, statistical analysis, regression and correlation analysis, analysis of variance and covariance, design of experiments.

Prerequisite: MATH 260

ENGR 304 MECHATRONICS – 3 semester hours Mechatronic Systems:

An introduction to designing mechatronic systems that includes integration of mechanical and electrical principles within a unified framework. Topics include low-level interfacing of software with hardware; use of programming tools to implement real-time computation; digital logic; analog interfacing; measurement and sensing; and controllers.

Prerequisite: ENGR 201 or equivalent

ENGR 305 MATERIALS ENGINEERING - 3 semester hours

Structure of matter. Physical and mechanical properties of materials including metals, polymers, ceramics, composites, and electronic materials. Equilibrium diagrams. Heat treatments, material selection and testing and corrosion phenomena.

Prerequisite: CHEM 151

ENGR 310 ENGINEERING ECONOMICS - 3 semester hours

Analysis of the time value of money as applied to the manufacturing environment. Economic analysis of engineering decisions. Determining rates of return on investments. Effects of inflation, depreciation and income taxes. Sensitivity, uncertainty, and risk analysis. Application of basic principles and tool of analysis using case studies.

Prerequisite: MATH 260

ENGR 313 THERMAL ENGINEERING - 3 semester hours

Basic concepts and definitions, properties of pure substance, work and heat, first law of thermodynamics, second law of thermodynamics, and introduction to conductive, convective, and radiative heat transfer.

Prerequisite: PHYS 112

Co-requisite: MATH 350

ENGR 315 DYNAMICS - 3 semester hours

Kinematics of particles and rigid bodies. Rectilinear motion, Curvilinear motion, Coordinates systems, velocity, acceleration, relative motion. Newton's second law. Kinetics of particles, Angular momentum, Work-energy methods, Impulse and momentum. Vector mathematics where appropriate.

Prerequisite: PHYS 112 and ENGR 210

ENGR 430 QUALITY ENGINEERING - 3 semester hours

An analysis of the basic principles of quality control, including Total Quality Management and design and analysis of process control charts and sampling plans.

Prerequisite: ENGR 301

MANUFACTURING ENGINEERING

MANE 205 MANUFACTURING PROCESS I - 3 semester hours

The types and properties of engineering materials including metals and polymers as employed in contemporary practice. The traditional manufacturing processing methods by which this materials are shaped into products such as machining, casting, forming, and fabricating techniques. Several experiments will be conducted.

Prerequisite: ENGR 102

MANE 210 MANUFACTURING PROCESS II - 3 semester hours

Modern manufacturing processes and related topics. Includes ceramics, composites, powder metallurgy, property enhancing and surface processing operations, rapid prototyping, and micro-fabricating. An introductory review of manufacturing support system including production planning and control, quality control, and measurement and inspection.

Prerequisite: MANE 205

MANE 307 MANUFACTURING PROCESSES – 3 semester hours

Introduction to operation and design of materials forming, materials removal processes, additive manufacturing, and joining in manufacturing, including product properties, process capabilities, processing equipment design, and economics.

Prerequisite: ENGR 305

MANE 310 – COMPUTED-AIDED MANUFACTURING WITH LAB - 3 semester hours

Design components and assemblies using wire-frame, surface and solid model generation. Manual NC part programming. Benefits, limitations, and selection of CAD and CAM systems. CAD as an input to CAM, and graphics-based NC programming. Configuration of CAD/CAM software, post-processor generation.

Prerequisite: ENGR 200 and MANE 210

MANE 315 MANUFACTURING AUTOMATION WITH LAB - 3 semester hours

Design of integrated production systems including flexible, programmed automatic control for fabrication, assembly, packaging, movement, and storage. Introduction to numerical control, industrial robotics, programmable logic controllers, and computer integrated manufacturing. Several experiments will be conducted.

Prerequisite: ENGR 201, ENGR 315 and MANE 210

MANE 317 MANUFACTURING SYSTEMS – 3 semesters

Basic principles of systems analysis and modeling applied to manufacturing processes and operations; numerical control, programmable controllers, flexible manufacturing systems, group technology, process planning and control, modeling and simulation of factory operations.

Prerequisite: MANE 307 Manufacturing Processes

MANE 400 SENIOR SEMINAR - 1 semester hour

Engineering design, literature searches, industry verses graduate school career options, ethics, professionalism and safety. The Fundamentals of Engineering (FE) Exam will be reviewed for students seeking certification as an Engineer-in-Training and subsequently as Professional Engineer. A departmental assessment examination on fundamental of engineering will be administrated.

Prerequisite: Senior standing in MANE.

MANE 410 PRODUCTION PLANNING AND INVENTORY Control - 3 semester hours

Analysis and design of systems for planning, scheduling and controlling production, inventory and service operations and activities using operations research and dynamic systems method. Inventory analysis and control for single and multi-item systems. Production control methods like MRP, MRP-II, JIT, and Kanban. Manufacturing Strategy and competitiveness.

MANE 415 PROJECT ENGINEERING AND MANAGEMENT - 3 semester hours

This course introduces Project Management skills needed to define, plan, monitor and complete projects as well as to identify the tools and techniques to resolve problems associated with bringing projects in on time and within an established budget and with high quality. Discussion will include application of network flow and sensitivity analysis in managing, scheduling and controlling a project with GANTT, CPM and PERT method. We will combines theories, techniques, group activities, and computer tools such as Microsoft Project.

MANE 420 SIMULATIONS - 3 semester hours

An introduction to discrete event simulation methods with emphasis on applications in manufacturing. The operations research topic of queuing theory is used to illustrate the importance of simulation as a problem-solving tool. Concepts and techniques of simulation modeling are covered as well as the statistical concepts and techniques required to obtain representative data, apply it to the model, and evaluate the results. A current high-level simulation language will be used to code the model for running on the computer.

Prerequisites: ENGR 301 and ENGR 203

MANE 440 MANUFACTURING STRATEGY/ERP - 3 semester hours

A study of development of economic production systems for discrete products in a competitive manufacturing environment. Emphasis is on the interrelationships between product design and production process selection. Concepts of design for manufacture and assembly, tool engineering, and manufacturing systems design are included.

Prerequisite: Senior standing in MANE

MANE 461, 462 SENIOR PROJECT 1, 11 - 2 semester hours per course

Faculty supervised projects typical of problems which graduates encounter in their professions and which involve costs, planning scheduling and research. Formal written reports suitable for reference library, that include discussions of methodology, results, and conclusions.

Prerequisite: Graduating Senior standing in MANE

MANE 499 SPECIAL TOPICS IN MANUFACTURING ENGINEERING - 3 semester hours

A course of independent study covering topics in Manufacturing Engineering as technical elective. Goal is to enhance student skills and knowledge in relevant topic.

Prerequisite: Permission of the instructor

PHYSICS**PHYS 100 PHYSICAL SCIENCE – 3 semester hours**

This physical science course is designed for non-science majors. It covers basic physical science areas relating to motion, momentum, angular momentum, energy, gravity, and thermodynamics.

Co-requisite: PHYS 100

PHYS 100 PHYSICAL SCIENCE LABORATORY – 1 semester hour

Laboratory experiments in measurement techniques, mechanics, heat, vibrations and waves.

Co-requisite: PHYS 100

PHYS 105 INTRODUCTION TO PHYSICS I – 3 semester hours

A study of the basic concepts of physics including vector algebra, momentum, angular momentum, energy gravity, and thermodynamics. This course is designed for science students.

Co-requisite: PHYS 105

PHYS 105 INTRODUCTION TO PHYSICS I LABORATORY – 1 semester hour

Laboratory experiments in measurement techniques, mechanics, heat, vibrations, and waves emphasizing proper methods of data and error analysis designed to complement PHYS105.

Co-requisite: PHYS 105

PHYS 106 INTRODUCTION TO PHYSICS II – 3 semester hours

A continuation of PHYS105 treating electrostatics, magnetism, circuits, optics, relativity, atomic structure, the nucleus and fundamental particles.

Prerequisite: PHYS 105

Co-requisite: PHYS 106

PHYS 106 INTRODUCTION TO PHYSICS II LABORATORY – 1 semester hour

Laboratory experiments in electromagnetism, wave motion, optics, atomic structure, and nuclear physics designed to complement PHYS 105.

Prerequisite: PHYS 105

Co-requisite: PHYS 106

PHYS 112 GENERAL PHYSICS I – 3 semester hours

A calculus-based study of the basic concepts of physics. Topics include vector algebra, kinematics, dynamics of single- and many particle systems, gravitation, energy, momentum, conservation laws, circular and rigid body motion, elasticity, fluid mechanics, thermal equilibrium, temperature, and the laws of thermodynamics with applications to ideal gases and thermodynamic processes.

Co-requisite: MATH 260; PHYS 112

PHYS 112 GENERAL PHYSICS I LABORATORY – 1 semester hour

Laboratory experiments in mechanics, fluids, and heat designed to complement PHYS112.

Co-requisite: PHYS 112

PHYS 113 GENERAL PHYSICS II – 3 semester hours

A continuation of PHYS112 treating electromagnetism and optics.

Prerequisite: PHYS 112

Co-requisites: MATH 261; PHYS 113

PHYS 113 GENERAL PHYSICS II LABORATORY – 1 semester hour

Laboratory experiments in electromagnetism and optics designed to complement PHYS 113.

Prerequisite: PHYS 112

Co-requisite: PHYS 113