ETS: ENGINEERING TECHNOLOGIES

Courses

	Credit(s)	Contact	Lab
ETS 1211C. INTRODUCTION TO PHOTONICS ENGINEERING DESIGN.	1	1	1

INTRODUCTION TO PHOTONICS ENGINEERING DESIGN Hands-on experiments on real-life optics & photonics, to develop abilities in design, control, and communication with photonic devices used in computers and/or smartphones.

ETS 1603C. FUNDAMENTALS OF ROBOTICS AND SIMULATION.	3	2	1

FUNDAMENTALS OF ROBOTICS AND SIMULATION Prerequisites: MTB 1329 or MAC 1105 and EET 1214C or EET 1084C or department approval. An introductory course designed to familiarize students with the basic principles of robotics and simulation. This course includes basic robotics concepts, operation, classification and applications. It provides a framework for the discussion of artificial intelligence. This course also includes basic principles of modeling and simulation as applied in different environments and systems. Students will become familiar with simulation and robotics systems. (Special Fee: $78.00).

ETS 1610C. PRINCIPLES OF VIRTUAL REALITY.	3	2	1

PRINCIPLES OF VIRTUAL REALITY Prerequisites: ETS 1603C An introductory course in Virtual Reality (VR) technology. The student will be introduced to the physical principles, technological challenges, possibilities, and limitations for the creation of virtual environments. Laboratory projects emphasize the visualization, exploration, and modification of scientific data in virtual environments.

ETS 2160C. SEMICONDUCTOR MANUFACTURING FUNDAMENTALS.	3	2	1

SEMICONDUCTOR MANUFACTURING FUNDAMENTALS An introductory course in the field of semiconductor manufacturing. Students will be introduced to fundamental scientific principles, processing, and applications of semiconductor manufacturing industry. Throughout the course, students will learn the types of semiconductors, the handling of semiconductors, and materials commonly used in the fabrication of semiconductor devices.

ETS 2161C. INTRODUCTION TO CLEANROOM OPERATION.	3	2	1

INTRODUCTION TO CLEANROOM OPERATION This course is an introduction to cleanroom operation in the semiconductor industry. A study of cleanroom facility, contamination, testing, and operation. Students will be introduced to various types of cleanroom standards and protocols, cleanliness and filtration requirements, environment testing and particle monitoring, and contamination issues.

ETS 2162C. INTRODUCTION TO CLEANROOM VACUUM SYSTEMS.	3	2	2

INTRODUCTION TO CLEANROOM VACUUM SYSTEMS Prerequisite: A minimum grade of C in ETS 2161C An overview of vacuum systems in semiconductor manufacturing. The course focuses on basic principles, components, and operation of vacuum pumps used in semiconductor cleanrooms. Course lectures are complimented with hands-on lab experiments to measure vacuum pressure, quantities of pressure, and check system for pressure leaks.

ETS 2163C. SEMICONDUCTOR FABRICATION PROCESS.	3	2	2

SEMICONDUCTOR FABRICATION PROCESS Prerequisite: A minimum grade of C in ETS 2161C This course is an introduction to the semiconductor fabrication process. Topics include the principles of semiconductor materials, the processes used to fabricate integrated circuits (ICs), cleanroom protocols, photolithography, doping, etching, thin film deposition, and process control. Students will also explore current trends and future advancements in semiconductor manufacturing.

ETS 2165C. SEMICONDUCTOR PACKAGING FUNDAMENTALS.	3	2	2

SEMICONDUCTOR PACKAGING FUNDAMENTALS Prerequisite: A minimum grade of C in ETS 2161C An introductory course on principles of semiconductor packaging with focus on basic concepts, materials, and packaging processes used to protect and enhance the performance of semiconductor devices. Students will develop practical skills by applying the theoretical knowledge gained in class in hands-on experiments.

ETS 2167C. SEMICONDUCTOR VACUUM SYSTEMS AND APPLICATIONS.	3	2	2

SEMICONDUCTOR VACUUM SYSTEMS AND APPLICATIONS Prerequisite: A minimum grade of C in ETS 2161C This course introduces students to the essential principles and practical applications of vacuum technology in semiconductor manufacturing. This course emphasizes the operation, maintenance, and troubleshooting of vacuum systems used in processes like thin film deposition, etching, and contamination control. Students will learn about industry safety standards, best practices, and the role of vacuum systems in emerging semiconductor technologies.

ETS 2210C. PRINCIPLES OF PHOTONICS.	3	2	2

PRINCIPLES OF PHOTONICS Prerequisite: MTB 1329 or MAC 1105 or higher. A course exploring the principles of Photonics theory, concepts, and applications. Contents include the nature and properties of light, light sources, human vision, and laser safety, basics of geometric and physical optics, and basic principles and applications of holography. Laboratory experimentations will complement theoretical concepts of the course. (Special Fee: $78.00).

ETS 2212. FOUNDATIONS OF PHOTONICS.	3	3	0

FOUNDATIONS OF PHOTONICS Prerequisite: Minimum grades of C in PHY 2049C, and MAC 2313 Corequisite: ETS 2212L Introduction to wave and photon models of light. Polarization and coherence. Interference and diffraction of light. Interferometers and spectrometers.

ETS 2212L. FOUNDATIONS OF PHOTONICS LABORATORY.	1	0	2

FOUNDATIONS OF PHOTONICS LABORATORY Corequisite: ETS 2212 The laboratory course is designed to reinforce the concepts discussed in class with a hands-on approach and to allow the students to learn laboratory techniques for observing optical phenomena and quantitative experimental characterization in geometrical optics, polarization, interference, and diffraction.

ETS 2215. GEOMETRIC OPTICS.	3	3	0

GEOMETRIC OPTICS Prerequisite: Minimum grade of C PHY 2048C. Corequisite: ETS 2215L Fundamentals of geometrical optics. Geometrical theory of image formation. Chromatic and monochromatic aberrations. Optical systems.

ETS 2215L. GEOMETRIC OPTICS LABORATORY. 1 0 2

GEOMETRIC OPTICS LABORATORY Corequisite: ETS 2215 Introductory optics lab that studies the behavior of light as rays. Reflection, refraction, and transmission. Lenses, mirrors, and prisms. Image formation and beam manipulation. Measure and characterize archetypal optical systems such as telescopes, cameras, and microscopes.

ETS 2220C. INTRODUCTION TO FIBER OPTICS. 3 2 2

INTRODUCTION TO FIBER OPTICS Prerequisite: MTB 1329 or MAC 1105 or higher. Prerequisite or Corequisite: ETS 2210C Basic concepts of fiber optics, fiber hardware, and its applications are introduced. Topics include Light and its properties, Fiber Preparation, Handling, and Laser Alignment Procedures; Numerical Aperture measurement techniques, Types of Optical Fibers; Measurement of Optical Fiber attenuation and related practical problems; Property of Optical Fibers, Connectors and Splicing methods, Couplers, Power Budget Calculations, Misalignment Measurements and Techniques, Fiber Optics Communication System, Fiber Amplifiers, Fiber Lasers, and Fiber Gratings, Transmitters, Receivers, and splitters. (Special Fee $66.00).

ETS 2221C. INTRODUCTION TO ELECTRO-OPTICAL DEVICES. 3 2 2

INTRODUCTION TO ELECTRO-OPTICAL DEVICES Prerequisite: ETS 2210C An introduction to the principles of opto-electronics design to those with a background in general electronics design, circuit theory, electronic devices, and digital techniques. Students will become familiar with radiometric and photometric theory, basic optics, and opto-electronic devices and methods. Devices covered are opto-electronic sources, detectors, lasers, and laser diodes, optocouplers, and fiber optics devices. This course includes several laboratory experiences. (Special Fee: $84.00).

ETS 2230C. INTRODUCTION TO LASERS. 3 2 2

INTRODUCTION TO LASERS Prerequisite: ETS 2210C This course introduces students to the principles of laser operations, safety, and applications. Topics include: Elements and Operation of a Laser, Laser Safety, Emission and Absorption of Light, Lasing Action, Optical Cavities and Modes of Oscillation, Temporal and Spatial Characteristics of Lasers, and Laser Classifications and Characteristics. Laboratory experimentations will complement and reinforce the theoretical concepts of lecture material. (Special Fee: $66.00).

ETS 2275C. MODELING AND SIMULATION. 3 2 2

MODELING AND SIMULATION Pre-requisite: ETS 1603C This course provides the student with a comprehension of modeling methods and the existing simulation types. It comprises the application of different modeling techniques utilizing physical parameters, math, computational techniques and equations. Emphasis will be placed on experimental modeling of discrete event and dynamic systems. Experimentation of some exercises will provide practical insights of modeling and simulation, and verification can be achieved by the discussion of observed behaviors. Principles of Object Oriented Programming will be discussed as how it is applied to Simulation.

ETS 2511C. ELECTROMECHANICAL SYSTEMS. 3 2 2

ELECTROMECHANICAL SYSTEMS Prerequisites: EET 1025C or EET 2035C or EET 2036C A study of devices and components that translate electrical energy into mechanical motion such as servo motors, stepping motors, solenoids, linear motors and actuators. The basic concepts and operational behavior of dc, induction, brushless dc, and stepper motors used in control applications are presented. (Special Fee: $59.00).

ETS 2531C. HUMAN MACHINE INTERFACES. 3 2 1

HUMAN MACHINE INTERFACES This course teaches the knowledge and skills needed to configure a computer display for the graphics of a process and its control system, using a human machine interface (HMI) software package. Topics include designing process graphics, designing alarm indicators, setting up trending graphs, establishing data logging files, linking the various process input to the graphic objects created, and linking the process inputs and outputs for display and data logging.

ETS 2535. AUTOMATED PROCESS CONTROL. 3 3 0

AUTOMATED PROCESS CONTROL Prerequisite: ETI 2542C This course introduces the modern approach to control theory, and the ideas of controllability. The popular proportional plus integral plus derivative (PID) control scheme is covered in detail. Other topics covered: Laplace transforms frequency domain, control of a second-order system, and compensating networks such as lead, lag, and lead-lag. Assignments provide experience with sensors, level control, flow control, pressure control, temperature control, DAC and ADC conversion, digital set point applications, and analog processing. The Allen-Bradley and Siemens processors will be used as the process controllers with a process control trainer to design, construct, interface, program and troubleshoot control circuits and systems.

ETS 2542C. PROGRAMMABLE LOGIC CONTROLLERS I. 3 2 2

PROGRAMMABLE LOGIC CONTROLLERS I Prerequisite: CET 2113C or CET 2114C. Introduction to theory of operation of analog and digital controllers and software techniques, including math tables, logic charts, and Boolean Algebra. Particular emphasis on ladder logic diagrams, including timing functions, counters, and master control relays. Laboratory projects provide practical insights into capabilities and limitations of programmable controllers in industrial applications. (Special Fee: $78.00).

ETS 2544C. ADVANCED PROGRAMMABLE LOGIC CONTROLLERS. 3 2 2

ADVANCED PROGRAMMABLE LOGIC CONTROLLERS Prerequisite: ETS 2542C A second course in PLC instructions and advanced process control routines as used in the manufacturing process and controlled by PLC's. Open and closed loop systems will be introduced together with PID (Proportional Integral Derivative), control, including feedback and control performance. (Special Fee: $71.00).

ETS 2604C. ROBOTICS APPLICATIONS. 3 2 2

ROBOTICS APPLICATIONS Prerequisite: ETS 1603C or department approval. This course is designed to introduce the student to the basic principles of robots including classification, operation, maintenance, troubleshooting, and applications in the robotics industry. Students will use hands-on practices to become familiar with sections of a robotic system. (Special Fee: $70.00).

ETS 2940C. SEMICONDUCTOR MANUFACTURING PRACTICUM. 3 2 1

SEMICONDUCTOR MANUFACTURING PRACTICUM Prerequisite: Minimum grades of C in ETS 2165C and EET 2141C This is a capstone course designed for Semiconductor Engineering Technology students to be taken in the final semester before graduation. Students are required to prepare and present a final project in semiconductor processing from wafer preparation to fabrication and packaging of semiconductor devices.

ETS 3010. ENGINEERING DOCUMENTATION AND COMMUNICATION. 2 2 0

ENGINEERING DOCUMENTATION AND COMMUNICATION Prerequisite: Minimum grade of C in ENC 1101 This course introduces the student to the importance of writing in the professional engineering career. Topics include guidelines for professional engineering writing, eliminating intermittent noise in writing, writing letters, memoranda, online communication, common engineering documents, reports, interviews resumes, and ethics in engineering writing. Minimum grade of C required if used to satisfy Electrical and Computer Engineering Technology, B.S. Degree requirement.

ETS 3020. ENGINEERING MANAGEMENT AND ETHICS. 2 2 0

ENGINEERING MANAGEMENT AND ETHICS Prerequisite: Minimum grade of C in ENC 1101 This course explores the traditional principles of management and professional ethics related to engineering technology professions. Major emphasis will be on project planning and design alternatives to meet cost, performance, and the user along with legal issues, professional development, and technology transfer as they relate to graduating engineering technology students. Minimum grade of C required if used to satisfy Electrical and Computer Engineering Technology, B.S. Degree requirement.

ETS 3663. ENGINEERING MANAGEMENT AND COMMUNICATION. 3 3 0

ENGINEERING MANAGEMENT AND COMMUNICATION Prerequisite: Minimum grade of C in ENC 1101 This course explores the traditional principles of management, professional ethics, and the importance of writing in the professional engineering career. Topics include project planning and design alternatives to meet cost, performance, and the user along with legal issues, professional development, technology, and guidelines for professional engineering writing. Minimum grade of C required if used to satisfy Electrical and Computer Engineering Technology, B.S. Degree requirement.

ETS 4216C. GEOMETRICAL AND WAVE OPTICS. 3 2 2

GEOMETRICAL AND WAVE OPTICS Prerequisites: ETS 1210C and minimum grade of C in EGN 3428 Basic principles of geometrical and wave optics. Topics include refraction and reflection, Gaussian optics, Paraxial optics, simple optical instruments, electromagnetic fields and waves; Fourier series and Fourier transforms; interference, interferometers, diffraction, image formation, and polarized light. Minimum grade of C required if used to satisfy Electrical and Computer Engineering Technology, B.S. Degree requirement.

ETS 4217C. OPTICAL ENGINEERING AND LENS DESIGN. 4 2 2

OPTICAL ENGINEERING AND LENS DESIGN Prerequisites: ETS 1210C or PHY2049C and a minimum grade of C in EGN 3428 Fundamentals of optical system layout and design; exact and paraxial ray tracing. Use of optical software in lens design, optical materials, aberrations theory and balancing, image evaluation. Minimum grade of C required if used to satisfy Electrical and Computer Engineering Technology, B.S. Degree requirement.

ETS 4228C. OPTICAL DETECTORS AND SYSTEMS. 3 2 2

OPTICAL DETECTORS AND SYSTEMS Prerequisites: ETS 1210C and minimum grade of C in EGN 3428 An in-depth study of Optical Detectors and Systems. Topics include: Photodetector, thermal detectors, figures of merit, responsivity, NEP, D*, and BLIP conditions, search systems, thermal-imager systems, optical detector classifications, quantitative detector comparisons, and Modulation Transfer Function. Minimum grade of C required if used to satisfy Electrical and Computer Engineering Technology, B.S. Degree requirement.

ETS 4236C. LASER ENGINEERING DESIGN. 4 2 2

LASER ENGINEERING DESIGN Prerequisites: ETS 1210C or PHY 2049C and minimum grade of C in EGN 3428 This course will cover the fundamental physical processes relevant to lasers and explore a variety of specific laser systems. Topics include optical resonators, laser gain and oscillation, pulsed and CW laser operation, system design considerations, and environmental effects. Focus on an examination of existing semiconductors lasers, solid-state lasers, fiber lasers, rare earth lasers, and systems that incorporate lasers as a primary component. Minimum grade of C required if used to satisfy Electrical and Computer Engineering Technology, B.S. Degree requirement.

ETS 4256C. OPTICAL COMMUNICATION SYSTEMS. 3 2 2

OPTICAL COMMUNICATION SYSTEMS Prerequisites: ETS 1210C or ETS 2220C or PHY 2049C and inimum grade of C in EGN 3428 Physics of optical communication components and applications to communication systems. Topics include fiber attenuation and dispersion, laser modulation, photo detection and noise, receiver and transmitter designs, bit error rate calculations, and coherent communications. Minimum grade of C required if used to satisfy Electrical and Computer Engineering Technology, B.S. Degree requirement.

ETS 4260. BIOPHOTONICS TECHNOLOGIES. 3 3 0

BIOPHOTONICS TECHNOLOGIES Prerequisites: ETS 2221C or PHY 2049C and minimum grade of C in EGN 3428 An overview of the field of biophotonics and the basic physics of light-biomatter interactions and tissue optics, light induced effects in bio-systems, diagnostic techniques and instrumentation, therapeutic instrumentation and applications, optical biosensors, imaging, and basics of optical tomography. A minimum grade of C is required if used to satisfy Electrical and Computer Engineering Technology, B.S. degree requirement.

ETS 4280C. ADVANCED ELECTRO-OPTICAL DEVICES. 4 2 2

ADVANCED ELECTRO-OPTICAL DEVICES Prerequisites: ETS 1210C or PHY 2049C and minimum grade of C in EET 3086C or department approval. This course aims to give a broad understanding of the physics and technology of discrete and integrated optical and optoelectronic components. The main focus is on important optoelectronic components such as waveguides, lasers, detectors and other photonic components. Minimum grade of C required if used to satisfy Electrical and Computer Engineering Technology, B.S. Degree requirement.

ETS 4361. NANOTECHNOLOGY SYSTEMS AND APPLICATIONS.	3	3	0

NANOTECHNOLOGY SYSTEMS AND APPLICATIONS Prerequisites: Minimum grades of C in EET 3086C and PHY 2049C An in-depth study of the fundamentals of nanoscience and nanotechnology in a wide range of applications. The main facets of nanotechnology are covered: nanomaterials, nanomechanics, nanoelectronics, nanoscale heat transfer, nanophotonics, nanoscale fluid mechanics, and nanobiotechnology. Minimum grade of C required if used to satisfy Electrical and Computer Engineering Technology, B.S. Degree requirement.