ENGINEERING MS

College of Science, Engineering & Technology

Department of Electrical and Computer Engineering and Technology
135 Trafton Science Center S • 507-389-5747

Department of Mechanical and Civil Engineering
205 Trafton Science Center E, 507-389-6383

The Engineering programs offer a Master of Science in engineering degree program. Students in this program may design their own program of studies by choosing courses from Electrical Engineering, Mechanical Engineering, Civil Engineering, Physics, Mathematics, and Computer Science. The program is designed to serve the following: those engineers in business and industry who want to continue their formal engineering education at the postgraduate level; new engineering graduates who want to increase their depth of knowledge and develop an area of specialization; those graduates from other related science and engineering disciplines who want to broaden their backgrounds by pursuing engineering studies at the graduate level.

Admission. Applicants must meet the general admission requirements of the College of Graduate Studies. A BS in Engineering or a closely related field from an accredited program with a minimum GPA of 3.0/4.0 is required. GRE scores are also required and the quantitative section score must be at least 700/800.

Financial Assistance. A limited number of graduate teaching assistantships are available for those individuals with substantial laboratory experience in Electrical or Mechanical Engineering or related fields. Research assistantships may be available to exceptional candidates. Half-time and quarter-time assistantships include tuition waivers (18 credits maximum). It is recommended that applications for financial assistance be made by February 28 because announcements are typically made prior to the end of April for the Fall semester.

MSE Program Options
The MSE offers three program options:

1. Thesis Option - The thesis program requires 32 credit hours of which at least 3, but no more than 6 semester credit hours will be devoted to the thesis.
2. Alternate Plan Paper - This plan requires a total of 34 semester credit hours with 1 credit hour devoted to the preparation of an alternate plan paper.
3. Design Option - The design option requires 32 credit hours of which at least 3, but no more than 6 semester credit hours will be devoted to the design.

In all cases MSE students must:
1. Obtain a minimum of 50% of all credit hours at the 6XX level
2. Take between 26 and 33 credits from courses in Electrical Engineering, Physics, Mathematics, Mechanical Engineering, Civil Engineering, or Computer Science
3. Obtain the approval of their major advisor and committee of their planned program of graduate study
4. Pass the comprehensive examination
5. Students choosing Thesis or Design options must present results of their work to their committee.

Combined Degree (BS and MS) Program
Students planning on completing their MSE degrees at MSU may be granted permission to take classes that would count toward their MSE. In order to be granted permission for this option, students must declare their intent to complete their MSE following their BS in engineering degrees and be "conditionally qualified" for a graduate program. Upon being accepted, students will be assigned a graduate committee by the department. Students need to be aware that acceptance into this option does not guarantee them automatic admission into the graduate school. In particular, students must complete their BSME, BSEE, or BSCE with a 3.0 GPA, and apply to be admitted as per the existing graduate school policy. Please contact the Department Graduate Coordinator for detailed information.

General Requirements
Each student must pass the comprehensive exam in order to graduate. The comprehensive exam will be given twice a year and each student has two opportunities to pass the exam. Students planning to take the comprehensive exam must submit a completed Written Comprehensive Examination Request and Report form to their department graduate coordinator. This request must be made one month before the exam in each semester. Students must complete at least 24 credits before they can take the comprehensive exam. The exact date will be posted on Department Bulletin Boards.

Required Thesis or Alternate Plan Paper

EE	694	APP(1) OR
ME	694	APP (1)
EE	699	Thesis/Design (3-6) OR
ME	699	Thesis/Design (3-6)

COURSE DESCRIPTIONS

MECHANICAL ENGINEERING

ME 516 (3) Thermal/Fluid Systems Design
The application of the principles of thermodynamics, fluid mechanics, and heat transfer to the design and analysis of selected energy systems of current interest, such as nuclear, solar, geothermal, and also conventional systems. Lecture and design projects.
Prerequisite: ME 324, ME 329

ME 518 (3) Mechanical Systems Design
The application of mechanics to the design and analysis of motion and force transmitting systems. Optimal design.
Prerequisite: ME 417

ME 520 (3) Computer Aided Engineering
Theoretical background in , and hands-on application of, both solid modeling and finite element methods. CAE Systems, Graphical standards, databases, solid modeling techniques. Derivation and solution of finite element equations for various types of elements and systems. Extensive use of modern software to perform both design and analysis.
Co-req: senior standing in ME

ME 522 (3) Mechanics of Composite Materials
Introduce anisotropic mechanics theories, engineering application of various composite materials, mechanical behaviors and fabrication of composites, experimental and theoretical approach for composite designs, contemporary issues such as nano/microcomposites.
Prerequisite: ME 223

ME 523 (3) Intermediate Mechanics of Materials
Stresses and deformation of curved beams, beams on elastic foundations, indeterminate problems, torsion of noncircular bars, introduction to plates and shells, thick walled cylinders, and failure theories.
Prerequisite: ME 417

ME 525 (3) Thermal Analysis & Control of Electronic Equipment
Thermal consideration in the design of heat-exchange equipment. Review of heat transfer modes; contact resistance; air handling. Numerical methods. Cooling techniques; fins, extended surfaces, cold plates, heat pipes, immersion cooling, thermoelectric coolers. Enhanced heat transfer.
Prerequisite: ME 324

ME 526 (3) Aerosol Theory and Technology
Introduction to the theory of aerosols and particulate systems. Properties, behavior, and physical principles of aerosols; including particle size statistic, Brownian motion and diffusion, and coagulation. Application in areas such as environmental systems, respiratory deposition, bioterrorism, and materials processing.
Prerequisite: ME 324.

ME 527 (3) Kinematics & Dynamics of Mechanisms
Computer-oriented methods of synthesis. Burmester's theory. Fixed and moving centrodes and their application to synthesis. Dynamics of mechanisms. Force and moment balancing of linkages.
Prerequisite: ME 417

ME 528 (3) Design Project I
The first course in a semester sequence that provides a complete design experience under professional guidance. This course covers: the product realization process, financial analysis, quality, patents, ethics and case studies. The students initiate a

design project early in the semester to be completed in ME 538.
Prerequisite: Senior standing in Mechanical Engineering

ME 529 (3) Energy Conversion
Methods of energy conversion. Topics may include hydroelectric, geothermal, wind and solar power generation, as well as unconventional methods of energy conversion. Term design problems.
Prerequisite: ME 324, ME 329

ME 533 (3) Design for Manufacture & Assembly
Current design for assembly (DFA) techniques are discussed. Both "manual" and software approaches are utilized, and enforced with numerous examples. Design for manufacturability (DFM) is addressed for many common manufacturing processes including: sheet metal, casting, forging, plastics, machining, snap fits, elastomers, surface finishes/protective finishes, powdered metal, and extrusions. Recent DFM software is utilized. Class project required.

ME 538 (3) Design Project II
The second course of a two semester sequence (see ME 528). This course includes: completion of the design project, design presentations, design report, design evaluations and manuals. Pre: Senior standing in Mechanical Engineering

ME 539 (3) Air Conditioning & Refrigeration
Refrigeration cycles and equipment, refrigeration properties, heating and cooling loads, psychometric analysis of air conditioning. Distribution of air conditioning medium and air quality as applied to design.
Prerequisite: ME 324, ME 329

ME 541 (3) Vehicle Dynamics
The dynamics of ground vehicles is studied, including pneumatic tires, vehicle handling, vehicle performance (including transmissions), modeling & simulation, and current research topics such as ITS/AVCS (Intelligent Transportation Systems Program/Advanced Vehicle Control Systems). Emphasis is on fundamentals, simulation, and limited experimentation. Class project required.
Prerequisite: Senior standing in Mechanical Engineering

ME 543 (3) Theory of Elasticity
Fundamental equations in three dimensions, plane stress and plane strain, flexure and torsion of bars of various shapes.
Prerequisite: ME 417

ME 550 (3) Finite Element Method
Energy method and residual approaches, 2D and 3D problems, in stress analysis, application to steady and transient heat flow, hydrodynamics, creeping flow, solution methods.
Prerequisite: ME 323 and ME 324

ME 562 (3) Vibrations
Free and forced vibration in linear single degree of freedom systems, design and analysis of multiple degree of freedom systems with and without damping, and vibration of coupled systems.
Prerequisite: ME 323, ME 341

ME 563 (3) Automatic Controls
Analysis of control systems using the methods of Evans, Nyquist, and Bode. Improvement of system performance by feedback compensation. Introduction to digital control.
Prerequisite: ME 341

ME 564 (3) Mechatronics
Synergistic combination of mechanical engineering, electronics, controls and programming in the design of mechatronic systems. Sensors, actuators and microcontrollers. Survey of the contemporary use of embedded microcontrollers in mechanical systems, case studies.
Prerequisite: ME 417, ME 463

ME 572 (3) Intermediate Heat Transfer
Basic concepts; physical and mathematical models for heat and mass transfer. Applications to conductive, convective, radiative, and combined mode heat transfer.
Prerequisite: ME 324

ME 591 (1-4) In-Service
Individual studies of problems of special interest. Open only to advanced students.

ME 597 (1-6) Internship

ME 582 (3) Transport Phenomena

ME 599 (1-6) Individual Study

ME 601 (3) Advanced Computational Methods in Engineering
Numerical methods for solving linear systems of equations, solution of non-linear equations, data interpolation, numerical differentiation, numerical integration, numerical solution of ordinary and partial differential equations.

ME 602 (3) Advanced CAE
Investigation, review, and application of emerging computer aided tools for engineering. Advanced FEA; optimization.
Prerequisite: ME 323, ME 324

ME 603 (3) Computational Fluid Mechanics and Heat Transfer
Nummerical methods (finite difference, finite volume, finite element) used for solving partial differential and integral equations of the type commonly occurring in fluid mechanics and heat transfer. Numerical solutions for selected problems in fluid mechanics and heat transfer. Use of CFD software.

ME 604 (3) Advanced CAD Techniques
This course helps the students develop an ability to define optimal design methodologies that will best implement the design intent and generate efficient designs. Various problems involving the use of modern, high-end industry standard software systems will be solved.
Prerequisite : ME 520.

ME 605 (3) Analysis and Design of Propulsion Systems
Prepares student to engage in analysis and design of modern propulsion systems. It is centered on the fundamentals of jet propulsion. Topics include: Thermodynamic cycle of the jet engine, Gas generator, Inlet, Compressor, Combustion Chamber, Gas Turbine, Nozzle, Afterburning Engines, Losses and performance estimation. Principles of construction, types of systems.
Prerequisite: ME 321, ME 329.

ME 606 (3) Engineering Aerodynamics
This course deals with the principles and theory of flying of heavier-than-air machines. Topics include: Properties of the atmosphere, basic lift theory, aerodynamics of the airplane, moments acting on the airplane, fundamental principles of aircraft stability and control, introduction to performance estimation (takeoff, landing, climb , cruise, maneuverability). Introduction to supersonic flight.
Prerequisite: ME 321.

ME 612 (3) Reinforced Polymers
Mechanics, materials analysis, fabrication, characterization, performance of Reinforce Polymers.
Prerequisite: ME 303

ME 623 (3) Experimental Stress Analysis
Review of elastic stress-strain relationships; application of fundamental concepts of static and dynamic strain measurements by electrical means; theory and use of resistance gages, strain gage circuits and recording instruments; rosette analysis. Introduction to photoelasticity.
Prerequisite: ME 323

ME 633 (3) Dynamics of Ground Vehicles
Theory and engineering principles of non-guided ground vehicles, both road and off-road. Analysis and evaluation of performance characteristics, handling behavior and ride quality. Emphasis is on fundamental principles and a unified method of approach to the analysis of various types of ground vehicles.
Prerequisite: ME 341

ME 640 (3) Advanced Design of Mechanical Devices
Systematic design of mechanisms, the creation of force functions, mechanisms with two or more degrees of freedom, systematic development of adjustable mechanisms, methods to achieve high speed in automatic machines.
Prerequisite: ME 327

ME 651 (3) Transport Phenomena
A survey of the transport of momentum, energy, and mass. Continuum approach.

Equations of change. Applications.

ME 655 (3) Advanced Fluid Mechanics
Detailed analysis of incompressible fluids, viscous/inviscid, laminar/turbulent and developing flows.
Prerequisite: ME 321

ME 665 (3) Combustion
Thermodynamics and chemical kinetics of combustion. Structure, propagation, and stability of flames. Environmental aspects.
Prerequisite: ME 321, ME 329

ME 669 (3) Advanced Energy Systems
Advanced selected topics in energy conversion, theory, design, and applications. Individual projects dealing with various aspects of advanced energy systems and associated energy sources.
Prerequisite: ME 324, ME 329

ME 672 (3) Conduction Heat Transfer
Analytical and numerical techniques for analysis of problems involving steady-state and transient heat conduction in solids.
Prerequisite: ME 324

ME 677 (1-6) Individual Study

ME 691 (3) In-Service: Technical Elective

ME 694 (1) Alternate Plan Paper Research

ME 699 (1-4) Thesis

CIVIL ENGINEERING

CIVE 532 (3) Properties of Concrete
Selected studies in the properties and design of concrete mixtures, cement chemistry, concrete durability, specialty concretes, concrete construction, admixtures, and quality control.
Prerequisites: CIVE 436 or consent of instructor.

CIVE 552 (3) Open Channel Flow
Analysis of open channel flow systems. Includes natural channels, designed channels, flow transitions, steady flow, unsteady flow, uniform flow, and non-uniform flow.
Prerequisites: CIVE 350.

CIVE 554 (3) Hydraulic Structures
Analysis and design of water regulating structures. Includes dams, spillways, gates, dikes, levees, stillin gbasins, water distribution systems, and various simpler structures. Environmental impacts of hydraulic structures are discussed throughout the course.
Prerequisite: CIVE 350.

CIVE 558 (3) Storm Water Management
Application of fluid mechanics and hydrology to the design of storm water management facilities.
Prerequisite: CIVE 350.

CIVE 561 (3) Fundamentals of Pavement Design
Performance and design of rigid, flexible, and composite pavement structures with emphasis on modern pavement design procedures. Principles of pavement maintenance and rehabilitation, and pavement management systems. Materials characterization, tests, quality control, and life cycle cost analysis.
Prerequisite: ME/CIVE 23, CIVE 360, and CIVE 370.

CIVE 567 (3) Earth Structures
Design and construction of traditional embankments, including slope stability analysis; earth and rockfill dams, including introduction to seepage analysis; excavations, earth retaining structures, and other geotechnical structures. Geotechnical software application in analysis and design.
Prerequisite: CIVE 360.

CIVE 571 (3) Highway Planning and Design
Introduces the classification and design process of highways; development and use of design controls, criteria, and highway design elements design of vertical and horizontal alignment, and establishment of sight distances design of cross-sections, intersections, and interchanges.
Prerequisite: CIVE 271 and CIVE 370.

CIVE 576 (3) Planning and Design of Airports
Development and design of airport facilities and the integration of multiple disciplines including runway orientation and capacity, terminal facilities, forecasting, planning, noise, airspace utilization, parking, lighting, and construction.
Prerequisite: CIVE 370

CIVE 581 (3) Water & Wastewater Treatment, Collection and Distribution
Overview of municipal water and wastewater treatment and distribution practices Application of chemical, biological and physical principles to design and operation of water and wastewater treatment and distribution systems.
Prerequisite: CIVE 380

ELECTRICAL ENGINEERING

EE 539 (4) Electronics for Non-Electrical Engineering Majors

EE 550 (3) Engineering Economics
Overview of accounting and finance and their interactions with engineering. Lectures include the development and analysis of financial statements, time value of money, decision making tools, cost of capital, depreciation, project analysis and payback, replacement analysis, and other engineering decision making tools.

EE 553 (3) Advanced Communication Systems Engineering
Fundamentals of RF, microwave, and optical communication systems. Advances information theory. Digital modulation techniques. Phase-lock loop receivers and frequency synthesizers. Characterization of digital transmission systems. Equalization. Synchronization. Coding. Data compression. Nonlinear system analysis. Amplitude and phase distortion. AM-PM conversation. Intermodulation and cross-modulation. Advanced spread spectrum systems.

EE 562 (3) Advanced Digital Systems
A study of finite-state machine design, hardware description language, processor datapath design, principles of instruction execution, processor control design, instruction pipelining, cache memory, memory management, and memory system design.

EE 567 (2) Principles of Engineering Design I

EE 571 (3) Advanced Control Systems
Develops design and analysis techniques for continuous and discrete time control systems, including pole placement, state estimation, and optimal control.
Prerequisite: EE 358 and 368

EE 572 (3) Digital Signal Processing
Develops design and analysis techniques for discrete signals and systems via Z-transforms, implementation of FIR and IIR filters. The various concepts will be introduced by the use of general and special purpose hardware and software for digital signal processing.
Prerequisite: EE 341

EE 575 (3) Integrated Circuit Engineering
Introduction to theory and techniques of integrated circuit fabrication processes, oxidation, photolithography, etching, diffusion of impurities, ion implantation, epitaxy, metallization, material characterization techniques, and VLSI process integration, their design, and simulation by SUPREM.
Prerequisite: EE 303 and EE 332

EE 576 (3) Antennas, Propagation, & Microwave Engineering
Principles of electromagnetic radiation, antenna parameters, dipoles, antenna arrays, long wire antennas, Microwave antennas, Mechanisms of radiowave propagation, scattering by rain, sea water propagation, guided wave propagation, periodic structures, transmission lines, Microwave millimeter wave amplifiers and oscillators, MIC & MMIC technology.
Prerequisite: EE 408

EE 577 (2) Principles of Engineering Design II

EE 578 (1-4) Topics in Engineering

EE 579 (3) Superconductive Devices

Magnetic and superconducting properties of materials, microscopic theory of superconductivity, and tunneling phenomenon. Josephson and SQUID devices, survey of computer memories, memory cell and shift register, A/D converters, and microwave amplifiers. Integrated circuit technology and high temperature superconductors.
Prerequisite: EE 303

EE 580 (1) Integrated Circuit Fabrication Lab
Introduction to integrated circuit fabrication processes, device layout, mask design, and experiments related to wafer cleaning, etching, thermal oxidation, thermal diffusion, photolithography, and metallization. Fabrication of basic integrated circuit elements including PN junction, resistors, MOS capacitors, BJT and MOSFET in integrated form. Use of analytic tools for in-process characterization and simulation of the fabrication process by SUPREM.
Prerequisite: EE 4/575 or concurrent with EE 4/575

EE 581 (1) VLSI Design Laboratory
Laboratory to accompany EE 584 VLSI design. Individual IC design projects will be assigned using IC layout tools and simulation software. Culminates in a group project fabrication under MOSIS.
Prerequisite: concurrent with EE 584

EE 584 (3) VLSI Design
VLSI technology. MOS and Bipolar transistor theory, SPICE models. Transistor structure and IC fabrication processes; layout design rules. Custom CMOS/BICMOS logic design and layout topologies; cell layout/chip partitioning/clocking. Bipolar/MOS analog circuit design and layout. Group design project. Library research study.
Prerequisite: EE 303 and EE 333

EE 591 (1-4) In-Service

EE 597 (1-6) Internship

EE 600 (3) Design Methods
Application of EE computer modeling and simulation tools. Design of experiments, Taguchi methods, automated data acquisition, and analysis methods.

EE 601 (3) Linear Systems Analysis
This course covers the analysis of continuous and discrete multivariate systems, linear models of stochastic and non-stochastic systems, and analog and digital sampled data systems. Issues examined include controllability, stability, observability, tensor properties, signal spectra, state equations, optimization, and computer simulation. A variety of case studies of advanced systems also examined.
Prerequisite: BS EE including undergraduate level systems analysis course work

EE 603 (3) Non-Linear System Analysis
This course covers the analysis of non-linear continuous and discrete systems and devices. Topics covered include non-linear circuit analysis, non-linear stochastic and non-stochastic system models, limit cycles, oscillators, stability, non-linear wave functions. Computer simulation will be utilized in conjunction with selected case studies in advanced non-linear systems.
Prerequisite: BS EE including undergraduate level systems analysis course work

EE 611 (3) Computer Hardware Algorithms
Study of major paradigms used in the evaluation and execution of algorithms. Algorithm analysis will include complexity measure, hardware requirements, organization and storage system requirement.

EE 612 (3) Computer Architecture Design
A treatment of computer architecture covering new technological developments, including details of multiprocessor systems. Special emphasis will be devoted to new concepts. Architectures of FPGAs and CPLDs will be explored and Hardware Description Languages such as VHDL and VERILOG will be used in project assignments.

EE 613 (3) Parallel Processors
Computer architecture for parallel processors designed for high computation rates. Primary emphasis is on image processing, pattern recognition, etc. Performance of various systems with regard to interconnect network, fault tolerance, and programming.

EE 614 (3) Advanced Embedded System Design
This course covers the programming model of a contemporary microprocessor/microcontroller. The course encompasses the interfacing and applications of parallel and serial I/O devices using the parallel and serial ports such as SPI, I2C, and CAN. Industrial standard interface such as USB and Ethernet would be discussed. Development tools would be reviewed and used in projects. Multi-tasking and real-time kernel would be presented and projects would be assigned. Memory technologies and expansion issues would be reviewed and taught.

EE 615 (3) Programmable Logic Design
Programmable logic design, simulation, synthesis, verification, and implementation using a Hardware Description Language (HDL), industry standard tools, and prototyping hardware. Mixed-level modeling including gate-level, dataflow and behavioral levels. HDL language constructs and design techniques. Logic timing and circuit delay modeling. Programming Language Interface (PLI). Advanced verification techniques.

EE 621 (3) Advanced Engineering Electromagnetics
Wave equations, solutions, wave propagation and polarization, reflection and transmission, rectangular wave guides and cavities, strip line and microstrip lines, and geometric theory of diffraction.
Prerequisite: EE 350 or equivalent

EE 622 (3) Microwave Engineering
Active and passive microwave devices, microwave amplifiers and oscillators, microwave filters, cavity resonators, microwave antennas, microwave receivers, microwave transmitters.

EE 623 (3) Radiation & Optical Electronics
Coherent and incoherent radiation, optical resonators, laser oscillators and amplifiers, propagation in optical fibers, integrated optical dielectric wave guides, semiconductor lasers, wave propagation in anisotropic, and non linear media, detection and noise.
Prerequisite: EE 350 or equivalent

EE 632 (3) Noise & Information Theory
Selected topics in the theory of probability and statistics. Spectral analysis. Rayleigh, Rician, Gaussian, and Poisson processes. Noise figure. Signal-to-noise ratio requirements for analog and digital communications, remote sensing, radar and sonar. Random signals in linear and nonlinear systems. Signal-to-noise enhancement techniques. Source encoding. Shannon's theorems.

EE 633 (3) Digital Communications
Digital communication system modulation techniques. A/D conversion. Additional noise sources from sampling and encoding. Error detection and correction. Speech encoding. Data compression. Data networks. Companding. Multiplexing. Packet switching. Performance of digital baseband. Digital Signal Processing. Digital system design trade-offs.

EE 642 (3) Advanced Integrated Circuit Engineering
Principles of silicon integrated circuit fabrication processes and design limitations. Process modeling, crystal growth, oxidation, implantation, diffusion, deposition. Processing of bipolar and MOS devices and circuits. Photolithography and design rules. Introduction to GaAs technology. Use of SUPREME.
Prerequisite: EE 4/575

EE 643 (3) Advanced VISI Design
Design and layout of passive and active electronic devices in silicon integrated circuits, both digital and analog. CMOS and bipolar circuit design principles will be developed. Assembly techniques and process control measurements and testing for yield control will be introduced.
Prerequisite: EE 4/584

EE 651 (3) Biomedical Engineering I
Mathematical modeling of living systems. Entropy and information. Thermodynamic constraints. Feedback and feedforward mechanisms in metabolic processes. Metabolic heat generation and loss. Energy flow in living systems. Atomic and molecular bonds in biological systems. Engineering analysis of the cardiovascular, renal, immune, endocrine and nervous systems; analysis of specific disease states.

EE 652 (3) Biomedical Engineering II
Physiological transport phenomena (intercellular, intracellular and membrane transport), strength and properties of tissue, bioelectric phenomena, muscle contraction, cardiovascular and pulmonary mechanics, design of artificial organs, diagnostic tools, therapeutic techniques in the treatment of cancer, material compatibility problems in prosthetics, and ethical dilemmas in biomedicine.
Prerequisite: EE 651

EE 663 (3) Advanced Communication Systems
Fundamentals of RF, microwave, millimeter wave, and optical communication systems. Link power budgets. Bandwidth constraints. Phase-locked loop receivers. Matched filters. Spread spectrum communication systems. Modulation formats. Comparison of active and passive sensing systems. Signal processing.

EE 674 (3) Advanced Control Systems II
Develops analysis and design techniques for multivariable feedback systems. Definitions of poles and zeros of multivariable systems are established. Study of design methods such as LQG, Youla parametrization and H optimal control.

EE 677 (1-4) Individual Study
Regular courses offered on demand by agreement with individual faculty members on an individual basis.

EE 691 (1-4) In-Service

EE 694 (1) Alternate Plan Paper
Alternate plan paper preparation.

EE 695 (1-5) Research
Thesis research.

EE 698 (1-4) Topics
Varied topics in Electrical and Computer Enginnering. May be repeated as topics change.

EE 699 (1-4) Thesis/Design Option
Thesis preparation.