5700. Economic Development. 3 hours. General analysis and survey of development theories, problems and policies involved with those countries that have not yet attained the level of economic well-being and integration observed in the United States. Individual readings and research required. Prerequisite(s): ECON 1100-1110 or consent of department. Students may not receive credit for both ECON 4600 and 5700. Usually offered spring term/semester.

5750. Urban and Regional Economics. 3 hours. Using economic analysis to understand the development of cities and regions and how economic activity in the area is organized. Explores the economics of transportation and urban problems such as poverty, segregation, crime and congestion. Prerequisite(s): ECON 3550. Students may not receive credit for both ECON 4650 and 5750.

5850. International Trade. 3 hours. Examines the nature and theoretical foundations of modern trade between nations. Topics to be covered include patterns of international trade and production, welfare implications of trade, impacts of tariffs and quotas, balance of trade and balance of payments issues. Analysis of trade implications of international monetary systems, multinational corporations, exchange rates and economic implications of political action. Individual readings and research required. Prerequisite(s): ECON 1100-1110 or consent of department. Students may not receive credit for both ECON 4850 and 5850. Usually offered fall and spring terms/semesters and 5W1 (summer session).

5880. Seminar on Current Health Care Economics Research. 3 hours. Topics include health care reform; problems associated with health insurance markets; alternative health care financing systems in the United States and other countries; health care regulation by the states; universal health care coverage; and the "public goods" nature of health care. Topics are subject to change depending on the current trends in the field and relevancy to students' interests. The course includes presentations and discussion of the student's research papers. Prerequisite(s): ECON 4180 or 5180.

5900-5910. Special Problems. 1–3 hours each. Open to advanced students capable of doing independent research under the direction of the instructor. To be registered for only on recommendation of the department chair.

5920-5930. Research Problems in Lieu of Thesis. 3 hours each. Required of Master of Science candidates majoring in economic research or labor and industrial relations who choose not to take the exit exam (Option 1). A problem in lieu of thesis with an emphasis on empirical studies will be written and submitted. Prerequisite(s): consent of department.

5950. Master's Thesis. 3 or 6 hours. To be scheduled only with consent of department. 6 hours credit required. No credit assigned until thesis has been completed and filed with the graduate dean. Continuous enrollment required once work on thesis has begun. May be repeated for credit. Required for Master of Arts and Master of Science in economics.

5960-5970. Economics Institute. 1–6 hours each. For students accepted by the university as participants in special institute courses. May be repeated for credit, but not to exceed a total of 6 hours.

Educational Administration and Supervision
see Teacher Education and Administration

Educational Curriculum and Instruction
see Teacher Education and Administration

Educational Foundations
see Teacher Education and Administration

Educational Psychology
see Technology and Cognition

Educational Research
see Technology and Cognition

Electrical Engineering

Electrical Engineering , EENG

5310. Control Systems Design. 3 hours. Control systems analysis, modeling and design constraints, goals, and performance specifications, state-space analysis of linear systems; Root-locus, frequency response and state-space design methods:; MATLAB simulations; system stability-introduction to Lyapunov methods; controllability; observability; canonical forms and minimal realizations, fundamentals of feedback control dynamic programming and the Hamilton-Jacobi-Bellman equation; synthesis of optimum state regulatory systems; introduction to the minimum principle, necessary conditions for optimal trajectories; minimum principle for bounded controls, and time-optimal control of linear systems. Prerequisite(s): EENG 2620 or equivalent.

5520. Digital Integrated Circuit Design. 3 hours. Thorough investigation of the fundamentals in design and analysis of MOS digital integrated circuits. Topics include MOS transistor, transistor circuit design and analysis, interconnect modeling, dynamic logic circuits, memories and low-power circuit design. Prerequisite(s): EENG 2710, EENG 3520 or equivalent.

5530. Analog Integrated Circuit Design. 3 hours. This course thoroughly investigates the fundamentals in design and analysis of analog and mixed-signal integrated circuits. Topics include analog MOS transistor models, current sources and sinks, circuit reference, amplifier, feedback amplifiers, differential amplifiers and operational amplifiers. Prerequisite(s): EENG 3520 or equivalent.

5610. Digital Signal Processing. 3 hours. Introduction to modern digital signal processing theory and techniques. Topics covered include discrete time signals and systems, sampling theorem, Z-transform, frequency analysis of signals and systems, discrete Fourier transform, fast Fourier transform algorithms, digital filter design, and multi-rate digital signal processing. Prerequisite(s): EENG 2620 or equivalent.

5620. Statistical Signal Processing. 3 hours. Introduction to detection and estimation theories. Vector space, multivariate normal distribution, quadratic forms, sufficiency and minimum variance unbiased estimator, hypothesis testing, Neyman-Pearson detection theory, Bayesian detection theory, maximum-likelihood estimation, Cramer-Rao bound, Bayesian and minimum mean-squared error estimators, Kalman filter, least-squares estimation, singular value decomposition algorithm. Prerequisite(s): EENG 4610 and MATH 6810 or equivalent.

5630. Adaptive Signal Processing. 3 hours. Provides students with fundamental knowledge of modern adaptive signal processing theorems and algorithms and their applications in radar and wireless communications. Search algorithms, LMS, RLS adaptive filtering, adaptive signal modeling and applications. Prerequisite(s): EENG 2620, 3910 or equivalent.

5640. Computer Vision and Image Analysis. 3 hours. Introduction to computer vision and image processing, image geometry and photogammetry, edge detection, feature extraction, shape representation, structural descriptions, object modeling, shape matching, semantic knowledge bases and imaging architectures, depth perception with stereo and photometric stereo, moving scene analysis and object tracking, multi-sensor data fusion, occluded object recognition by multi-sensor/multi-view integration, Computer vision applications.

5810. Digital Communications. 3 hours. Decision theory, signal space, optimal receivers, modulation schemes, error performance, bandwidth, channel capacity, block coding, convolutional coding, trellis coded modulation, inter-symbol interference, fading channels and spread spectrum. Prerequisite(s): EENG 3810 or equivalent. (Same as CSCE 5570.)

5820. Wireless Communications. 3 hours. Fundamentals of wireless communications. Topics covered include radio propagation channel characteristics and models, modulation, coding and receiver signal processing techniques in fading channels, multiple access techniques for wireless systems, fundamentals of wireless networks, and major cellular and wireless LAN standards. Prerequisite(s): EENG 5810 or equivalent. (Same as CSCE 5510.)

5830. Coding Theory. 3 hours. Channel coding theorem, error-correcting codes, algebraic block codes, linear codes, BCH codes, convolutional codes, burst-error correcting codes, and design of encoders and decoders. Prerequisite(s): EENG 3810 or equivalent.

5890. Directed Study. 1–3 hours. Study of topics in electrical engineering. The student should prepare a plan for study of a topic and a plan for evaluation of study achievements. Open to students with graduate standing who are capable of developing problems, independently. May be repeated for credit. Prerequisite(s): consent of department.

5900. Special Problems. 1–3 hours. Independent research of a specific problem in a field of electrical engineering. A report is required defining the problem and a solution. Prerequisite(s): consent of department.

5950. Master's Thesis. 3–6 hours. To be scheduled only with consent of department. No credit assigned until thesis has been completed and filed with the School of Graduate Studies. Prerequisite(s): consent of department.

Electronics Engineering Technology
see Engineering Technology

Elementary Education
see Teacher Education and Administration

Emergency Administration and Planning
see *Undergraduate Catalog*

Engineering Technology

Construction Engineering Technology – see *Undergraduate Catalog*

Electronics Engineering Technology, ELET

5300. Embedded Controllers. 3 hours. (2;2) The study of the technical aspects of real-time software systems: software development methodologies, operating system and real-time kernel concepts.

5310. Industrial Process Controls. 3 hours. (2;2) Use of programmable controllers and microcomputers as controllers in industrial processes; topics include sensors and transducers, data acquisition, control devices and the nature of digital control.

5320. Introduction to Telecommunications. 3 hours. An introduction to the technology, standards, systems and practices of the telecommunications industry to include equipment, switched and dedicated communications lines, and voice and data communications.

5330. Instrumentation System Design. 3 hours. (2;2) The major objectives of this course are instrumentation design techniques, transducer selection, and interfacing control and measurement signals to the system. The use of graphical and structured programming techniques in the design of virtual instrument systems will constitute a significant portion of the course. Completion of a capstone project incorporating a summation of learning experiences from the entire curriculum is a requirement of the course. Must be taken the last term/semester offered prior to graduation. Prerequisite(s): completion of ELET required courses; course is to be taken within the last 12 hours of the degree plan.

5340. Digital Logic Design Techniques. 3 hours. (2;2) Study of the design, simulation and implementation of digital logic circuits including combinational and sequential logic, algorithmic state machines, hardware test techniques, software used in design, simulation and an introduction to the use of VHDL programming language. Oral and written documentation required.

5800-5810. Studies in Engineering Technology. 1–3 hours. Organized classes specifically designed to accommodate the needs of students and the demands of program development that are not met by regular offerings. Short courses and workshops on specific topics, organized on a limited-offering basis, to be repeated only upon demand. May be repeated for credit.

5900-5910. Special Problems. 1–3 hours. Open to graduate students capable of developing a problem independently.

Engineering – see *Undergraduate Catalog*

Engineering Technology, Master's Courses, MSET

5000. Orientation to Engineering Technology. 1 hour. Review of policies and procedures of the engineering technology program, department, college and university regarding graduate studies. Formation of graduate committee and selection of major adviser. Development and submission of degree plan. Review of thesis procedures including library utilization, available programs of study and current faculty departmental research. Procedures and responsibilities of assistantships and scholarships. Determination of technical writing ability.

5010. Seminar in Engineering Technology. 3 hours. In-depth examination of current theories, research, trends and processes of industry. Readings, individual study and research, information exchange and guest lectures provide an understanding of selected industrial topics. May be repeated for credit.