instruction, structuring instructional sequences for maximum content retention.

7509 ECE Systems for Educators (3) Prereq.: ELRC 4507 and 5070 or equivalent. 2 hrs. lecture; 2 hrs. lab. Authoring systems, with emphasis on Super PILOT and LOGO for individualized learning; system variables, transfer and portability parameters, student involvement, alternative systems and formative and summative evaluation procedures.

7516 Visual and Personalized Learning (3) Prereq.: ELRC 7420 or 7505; or consent of instructor. 9-18 hrs. lab. Practical experience in teaching, producing, utilizing and administering teaching techniques.

7517 Seminar in Educational Media (3) Prereq.: ELRC 7240 and 7420, or consent of instructor. Advanced topics in instructional and educational technology.

7520 Educational Technology in Business, Industry, and Government Agencies (3) Prereq.: ELRC 7503 and one of the following: ELRC 5305, 7502. Techniques used to meet training and development needs in business, industry and governmental agencies.

7525 Professional Development for K-12: Technology Integration (3) Analyze effective professional development strategies; plan, design and implement and evaluate technology staff development activities.

7535 Advanced Telecommunications and Electronic Learning (3) Prereq.: ELRC 4507 or consent of instructor. Scope and elements of the online environment; technologies and strategies for teaching and learning; design, development or conversion of courses for online delivery; course management, assessment and evaluation; policy issues.

7570 Theory and Research in Educational Technology (3) Prereq.: ELRC 7240 and 7503. For advanced graduate students preparing for professional research and development in educational technology; emphasis on theories of communication, learning theories, educational psychology and behavioral sciences.

7791 Integrative Analysis (3) Prereq.: ELRC 36. Preparation for a successful career in technology; emphasis on theories of communication, learning problems in an environment.

7795 Research and Evaluation in Higher Education (3) Historical and socio-political perspectives on the higher education experiences of women, African-Americans, Asian-Americans and Hispanics, focusing primarily on the period from the 1960s to the present.

7801 Foundations of Higher Education (3) History of the sociological and philosophical foundations for higher education in the United States.

7803 Leadership in Higher Education (3) Analysis of leadership issues and theory relating to postsecondary educational leadership prescacy and academic governance; institutional culture; student diversity, curricular change and programs that grow higher education.

7804 Politics and Policy of Higher Education (3) Political and policy issues surrounding higher education; issues of race and gender, politics and policy of student loans; politics toward underrepresented college students; collective bargaining; the accreditation process.

7805 Higher Education and the Law (3) Legal issues concerning higher education, including tenure, academic freedom, campus crime, sexual harassment, laws against discrimination, student discipline and liability for accidents and injuries.

7806 Curriculum and College Teaching (3) Critical analysis of college curriculum and approaches to teaching; historical development of curricular models; introduction to teaching and learning theories.

7807 Finance in Higher Education (3) Public policy and the role of higher education is discussed. Topics include taxation, pricing, tuition policy, financial management of institutions and financial aid. 

7809 Strategic Planning in Higher Education (3) Strategic plans for institutions of higher education; processes by which those plans are developed; higher education strategy within the context of the regional and competitive environment; emphasis on current topics in organizational strategy.

7810 Assessment and Evaluation in Higher Education (3) Analysis of various evaluation practices, assessment for education; role of assessment in policy development and strategic planning.

7811 Cognitive Students in the United States (3) Critical analysis of issues related to college students in the United States, including access, choice, climate, student organizations and development and identity.

**ELECTRICAL ENGINEERING**

2120 Circuits I (3) Prereq.: credit or registration in MATH 2090 and PHYS 2102 required or consent of department.

2129 Circuits II (3) Prereq.: EE 2120, PHYS 2102 and MATH 2506. Frequency-domain analysis of electrical networks.

2230 Electronics I (3) Prereq.: EE 2120. Terminal behavior of semiconductor devices and basic circuits; Ohm's law; basic network theorems; operational amplifiers.

2231 Electronics Laboratory I (2) Prereq.: concurrent registration in EE 2230. 1 hr. lecture; 2 hrs. lab.

2250 Digital & Analogue Electronics (3) Prereq. ENGL 1550 or equivalent. Boolean algebra, logic gates; minimization methods; analysis and synthesis of combinational logic networks; design examples.

2730 Digital Logic II (2) Prereq.: EE 2720. Analysis and design of sequential circuits; practical impact of design choices and applications.

2731 Digital Logic Laboratory (2) Prereq.: EE 2730. 1 hr. lecture; 2 hrs. lab. Familiarization with conventional logic gates and flip-flops; design and testing of various combinational and sequential logic functions; and practical aspects of digital design.

2950 Comprehensive Electrical Engineering (3) Prereq.: MATH 1525 or equivalent. For nonelectrical engineering majors. Elementary circuits, devices and systems in electrical engineering.

4507 3601 Special Projects (2) Prereq.: consent of department. Pass-fail grading. Individual work with instructor on special project selected by student and instructor.

4070 Engineering Practice (3) Prereq.: permission of department. 12 months full-time employment in an appropriate area. Final written report required. Work experience.

4250 Digital Integrated Circuits (3) Prereq.: EE 2230, 3221 and 3232. 2 hrs. lecture; 2 hrs. lab. ABET category; 2 hrs. design; 1 hr. engineering science. Design and implementation of logic gates for application-specific integrated circuits; system design methodology using circuit simulation and design of analog systems.

4242 VLSI Design (3) Prereq.: EE 2730, 3220, 2 hrs. lecture; 2 hrs. lab. ABET category; 2 hrs. design; 1 hr. engineering science. Design and implementation of logic gates in bipolar and MOS technology; semiconductor memories and their operations.

4260 Semiconductor Measurements and Characterization (3) Prereq.: consent of department. 2 hrs. lecture; 2 hrs. lab. Properties of semiconductor materials; their influence on device characteristics; current transport characteristics such as resistivity, mobility, and lifetime; diffusion profiles and oxide layers; thin film characterization techniques; I-V and C-V measurements; and applications.

4262 Electronic Instrumentation and Metrology (3) Prereq.: EE 2230 and 3212 or equivalent. 2 hrs. lecture; 2 hrs. lab. ABET category; 2 hrs. design; 1 hr. engineering science. Analysis and understanding of components, and measurement of time-domain analysis of electrical networks.

4420 Power System Protection (3) Prereq.: EE 3510 and 3520 or equivalent. Wave propagation at microwave and optical frequencies in metallic systems; basic measurements and applications.

4450 Distribution System Design (3) Prereq.: EE 3410 or equivalent. Design of integrated circuit logic gates in bipolar and MOS technology; semiconductor memories and their operations.

4460 Research for Undergraduates I (3) Prereq.: permission of department and either completion of one co-op session or six months full-time employment in an appropriate area. Final written report required. Work experience.
4460 Power Electronics (3) Prereq.: EE 3220 and 3410. 2 hrs. lecture; 2 hrs. lab. ABET category: 2 hrs. design; 1 hr. engineering science. Compensation of single loop and multiloop systems; state estimation; stability; application to industrial control systems; computer simulation packages.

4585 Discrete Control System Design (3) Prereq.: EE 3530. ABET category: 2 hrs. design; 1 hr. engineering science. Sampled-data control systems: analysis and design of sampled data systems; discrete-time systems and controls.

4600 Random Processes 1 (3) Prereq.: EE 3140 or equivalent. Probability spaces; random variables and processes; second order processes; spectral analysis; filtering.

4700 Special Topics in Computer Engineering 1 (3) Prereq.: EE 3220 and 3410; or one of EE 3420, EE 3530, 3530, 3610, or 3775. 2 hrs. lecture, 2 hrs. lab. ABET category: 2 hrs. design; 1 hr. engineering science. Design and test of DC and AC motor variable speed drives combined with an analysis of the hardware and software.

4560 Introduction to Modern Control (3) Prereq.: EE 3530. State variable methods for analysis and design of control systems; realization, stability and stabilization; observers, control design.

45 Topics in Control System Design (3) Prereq.: EE 3530. ABET category: 2 hrs. design; 1 hr. engineering science. Compensation of single loop and multiloop systems; state estimation; stability; application to industrial control systems; computer simulation packages.

4775 Networked Games and their Algorithms (3) Prereq.: CSC 3102 or equivalent. 3 hrs. lecture. Algorithm for computer games and artificial intelligence. Compensating for latency and bandwidth constraints in massively multiplayer online games.

4780 Introduction to Expert Systems (3) Prereq.: EE 3750 or equivalent. ABET category: 2 hrs. design; 1 hr. engineering science. Computer processing of images, including segmentation; preprocessing techniques; image representation and design using image processing software.

4785 Introduction to Expert Systems 2 (3) Prereq.: EE 3750 or equivalent. Introduction to expert systems, including rule-based systems; search strategies; representation and logic programming.

4790 Structure of Computers and Computations 1 (3) Prereq.: CSC 3102 and EE 3755. Hardware and software complexity analysis and implementation on computers and computations.

4810 Senior Design 1 (3) Prereq.: EE 3220, 3751, senior standing in the College of Engineering, and one of EE 3410, 3530, 3610 or 3775. 2 hrs. lecture, 2 hrs. lab. Senior design project.

4810 Senior Design 2 (3) Prereq.: EE 4810. 6 hrs. lab. Continuation of senior design projects from EE 4810. Construction and testing.

4859 Digital Computer Architecture Capstone (3) Prereq.: At least 15 hours credit towards the Digital Media TECH minor. 2 hrs. lecture. 2 hrs. lab. Credit will not be given for both EE 4859 and ART 4575. ABET category: 2 hrs. design; 1 hr. engineering science. Preparing a group of interdisciplinary team to prototype a digital media or artistic application.

4900 Advanced Topics in Electrical Engineering (3) Prereq.: May be taken for a max. of 12 hrs. of credit when topics vary. 7091 Electrical Engineering Research 1 (3) Prereq.: permission of the department. Pass-fail grading. Individual study.


7100 Advanced Topics in Signal Processing (3) Prereq.: May be taken for a max. of 12 hrs. of credit when topics vary. 7100 Network Analysis and Synthesis (3) Prereq.: consent of instructor. Network analysis and synthesis, network graph theory, state diagrams, network models, networks, computer-aided analysis and design.

7120 Linear Active Network Analysis and Synthesis (3) Prereq.: 3140 or equivalent. Active network analysis and design, multiport networks, pathological elements, inductorless filter theory.


7150 Theory and Application of Digital Signal Processing (3) Prereq.: EE 3160 or equivalent. Digital filter design, spectrum analysis, digital hardware implementations and applications.

7200 Advanced Topics in Electronics (3) May be taken for a max. of 12 hrs. of credit when topics vary. 7210 Semiconductor Devices I: Bipolar (3) Prereq.: EE 3530 or equivalent. Semiconductor material properties, equilibrium and nonequilibrium processes, physical principles of p-n junctions and quasi-neutral material, modeling of diodes and bipolar transistors.

7222 Semiconductor Devices II: Field Effect (3) Prereq.: EE 3532 or equivalent. Surface effects; metal-insulator-semiconductor structure; modeling of MOS capacitors and transistors.

7230 Physics of Device Electronics (3) Semiconductor physics and necessary assumptions for tractable device analysis; elements of statistical physics, transport phenomena in semiconductors, band structure, solid and semiconductor junctions.

7232 Small-Geometry and High-Speed Devices (3) Prereq.: EE 7230 or equivalent. Charge carrier transport in small active devices including the mobility and velocity of solids and semiconductor junctions.

7240 Integrated Circuit Engineering (3) Prereq.: Design or permission of instructor. The analysis and identification of linear, discrete and continuous time, control systems; state variable and fractional description techniques, functional analysis.

7250 Optimal Control Theory (3) Prereq.: EE 4560 or equivalent. Dynamic optimization applied to control systems; minimum principle, Hamilton-Jacobi Bellman theory, dynamic programming, gradient algorithms and functions.