Electrical Engineering: Circuits and Systems

**EECT 5321** Introduction to Circuits and Systems (3 semester hours) Continuation of **EEMF 5320**. Topics include analog circuits, digital circuits, digital systems and communication systems. Credit does not apply to the 33 hour M.S.E.E. requirement. (3-0) R

**EECT 5340** Analog Integrated Circuit Analysis and Design (3 semester hours) Application of MOSFET and BJT large-signal and small-signal models to analyze and design amplifiers, analysis and design of current mirrors and differential amplifiers, analysis of frequency response of amplifiers, and feedback theories. Prerequisite: **EE 3311** or equivalent. (3-0) Y

**EECT 5385** Analog Filters (3 semester hours) This course aims at bridging the intermediate-level and the advanced-level knowledge in analog filter design. It moves from basic theory of analog passive filters to theoretical and practical aspects of active, switched-capacitor, and continuous time filters. For active solutions the focus is on integrated implementations on silicon. Prerequisites: **EE 3301** and **EE 3111**. (3-0) Y

**EECT 6325** (CE 6325) VLSI Design (3 semester hours) Introduction to MOS transistors. Analysis of the CMOS inverter. Combinational and sequential design techniques in VLSI; issues in static, transmission gate and dynamic logic design. Design and layout of complex gates, latches and flip-flops, arithmetic circuits, memory structures. Low power digital design. The method of logical effort. CMOS technology. Use of CAD tools to design, layout, check, extract and simulate a small project. Prerequisites: **EE 3320**, **EE 3301** or equivalent. (3-0) S

**EECT 6326** Analog Integrated Circuit Design (3 semester hours) Further treatment on the use of MOSFET and BJT large signal and small signal models to analyze and design analog integrated circuits. Topics include advanced current mirrors, references, frequency response of single-stage and differential amplifiers, stability and compensation of amplifiers, design of two-stage amplifiers, common mode feedback, and introduction of noise analysis. Use of CAD tools to simulate and design analog integrated circuits. Prerequisite: **EE 4340** or **EECT 5340**. (3-0) S

**EECT 6378** Power Management Circuits (3 semester hours) This course introduces different circuits related to power management systems. Topics include analysis and design of voltage references, magnetics, and different dc-dc converters including: switched-mode power converters, linear regulators and switched-capacitor charge pumps. Use of CAD tools to design and simulate power management circuits. Prerequisite: **EECT 6326** or equivalent. (3-0) Y

**EECT 6379** Energy Harvesting, Storage and Powering for Microsystems (3 semester hours) This course studies the electrical characteristics of various renewable energy sources and the corresponding approaches on harvesting and storage, with emphasis on the imposed requirements of microscale dimension. They are followed by the discussion on power conditioning and cross-layer energy/power management with circuit implementations. Prerequisite: **EE 3311** or equivalent. (3-0) Y

**EECT 7325** (CE 7325) Advanced VLSI Design (3 semester hours) Advanced topics in VLSI design covering topics beyond the first course (EECT 6325). Topics include: use of high-level design, synthesis, and simulation tools, clock distribution and routing problems, (a) synchronous circuits, low-power design techniques, study of
various VLSI-based computations, systolic arrays, etc. Discussions on current research topics in VLSI design. Prerequisite: EECT 6325 or equivalent. (3-0) R

ECT 7326 Advanced Analog Integrated Circuit Design (3 semester hours) Advanced topics in analog design including a rigorous treatment of noise, feedback and distortion in analog circuits. Selected topics from other advanced topics such as continuous-time filter, oscillator, phase-locked loop (PLL) and delay-locked loop (DLL) are also covered. Prerequisite: EECT 6326. (3-0) T

ECT 7327 Data Converters (3 semester hours) Data converter circuits in modern mixed-signal VLSI systems. Topics include sampling, switched-capacitor amplifiers and integrators, sample-and-hold circuits, voltage comparators, Nyquist-rate and oversampling converters. Prerequisite: EECT 6326. (3-0) T

ECT 7331 Physics of Noise (3 semester hours) The physics of fluctuation phenomena, generically called Noise. The class will cover the fundamental physical principles underlying generation-recombination, thermal, shot, 1/f noise and other, related fluctuation phenomena. The statistical nature of these physical processes will be developed. The physics of noise in resistors, diodes, bipolar, JFETS, and MOSFETs will be discussed and how to model it in circuits. Approximately two thirds of the class will be devoted to the physics of noise and the rest will cover how to use this knowledge to design low-noise integrated circuits. Prerequisite: EECT 6326. (3-0) R

ECT 7v88 Special Topics in Circuits and Systems (1-6 semester hours) For letter grade credit only. (May be repeated to a maximum of 9 hours.) ([1-6]-0) R