305 Electromagnetic Fields and Waves I
Fall, Spring. 4(4-0) P:M: (MTH 235 or concurrently or MTH 255H or concurrently) and (PHY 184 or PHY 184B or PHY 234B) R: Open only to students in the Department of Electrical and Computer Engineering. SA: EE 305
Transient and time-harmonic transmission lines. Smith charts. Two-port networks. Maxwell’s equa-
tions. Force, energy and power. Plane electromag-
netic waves. Guided waves.

313 Control Systems
Fall, Spring. 3(3-0) P:M: (ECE 202 and ECE 345) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering and Department of Computer Science and Engi-
neering. SA: EE 413, ECE 413
Analysis and design of control systems using trans-
fer functions and state variable methods.

320 Energy Conversion and Power Electronics
Fall, Spring. 3(3-0) P:M: (ECE 302 and ECE 303 and ECE 305) SA: EE 320
Power systems and motor drives. Power supplies and motor drives.

331 Microprocessors and Digital Systems
Fall, Spring. 4(3-3) P:M: (CSE 131 or concurrently) SA: ECE 331
Microcomputers. Microprocessor architecture. Ad-
dressing modes. Assembly language programming. Parallel and serial input and output. Interfacing. Interrupts. Peripheral device controllers. Applica-
tions, design.

345 Electronic Instrumentation and Systems
Fall, Spring. 3(3-0) P:M: (MTH 235 or MTH 255H or concurrently) and (PHY 184 or PHY 234B) and completion of Tier I writing requirement. R: Open only to students in the Department of Electrical and Computer Engineering with the exception of students in the Department of Electrical and Computer Engineering. SA: EE 345
Electrical and electronic components, circuits and instruments. Circuit laws and applications, frequency response, operational amplifiers, semiconductor devices, digital logic, counting circuits.

366 Introduction to Signal Processing
Spring. Summer. 3(3-0) P:M: (ECE 202) R: Open only to students in the Department of Electrical and Computer Engineering. SA: EE 360
Continuous- and discrete-time signal analysis fund-
amental to modern signal processing and commu-
nications technologies. Fourier and spectral analysis of signals. Elementary modulation techniques. Filter-
ing and channel models. The z-transform. Introduc-
tion to random processes and noise in discrete time. Application examples.

405 Electromagnetic Fields and Waves II
Fall, 4(4-0) P:M: (ECE 305) R: Open only to juniors or seniors or graduate students in the Electrical Engineering major and to juni-
ors or seniors in the Computer Engineering major. SA: ECE 435
Microwave networks. Scattering parameters. Solu-

407 Electromagnetic Compatibility
Spring. 4(3-3) P:M: (ECE 402 and ECE 405 and ECE 366) R: Open only to juniors or seniors or graduate students in the Electrical Engineering major and juniors or seniors in the Computer Engineering major.
Electromagnetics for electrical systems. Signals and spectra. Regulations. Radiated and conducted emissions. Conducted and radiated immunity. Mit-
gation techniques.

410 VLSI Design
Fall, Spring. 4(3-3) P:M: (CSE 302 or ECE 331) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering or Department of Computer Science and Engi-
neering. SA: EE 411

415 Computer Aided Manufacturing
Fall. 3(2-3) P:M: (ECE 313 or ME 451) R: Open only to juniors or seniors in the Manu-
facturing Engineering major. SA: EE 415
CAD/CAM fundamentals, programmable controllers, numerical control, NC part programming, sensors, data acquisition systems.

418 Algorithms of Circuit Design
Fall. 3(3-0) P:M: (ECE 302 and ECE 303 and ECE 366) R: Open only to juniors or seniors or graduate students in the Depart-
ment of Electrical and Computer Engineering. SA: EE 418
Design of analog electrical circuits, filter functions, ladder synthesis, inductor simulation, Vector New-
ton-Raphson method. Lossy inductance and capaci-

421 Power System Analysis
Spring. 4(3-3) P:M: (ECE 320) SA: EE 421
Electrical and Computer Engineering—ECE

457 Communication Systems
Spring, 3(3-0) P-M: (ECE 302 and ECE 366 and STT 351) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering. SA: ECE 457

458 Communication Systems Laboratory
Spring, 1(0-3) P-M: (ECE 303 and ECE 457 or concurrently) SA: EE 458
A projects laboratory in communication systems.

466 Digital Signal Processing and Filter Design
Fall, 3(3-0) P-M: (ECE 366) R: Open only to seniors or graduate students in the Department of Electrical and Computer Engineering. SA: EE 466

474 Principles of Electronic Devices
Fall, Spring, 3(3-0) P-M: (ECE 302 and ECE 305) SA: EE 474
Energy levels in atoms. Crystal properties, energy bands and charge carriers, semiconductors, transport properties of bulk materials. P-n junction diodes, bipolar transistors, field effect transistors.

476 Electro-Optics
Fall, Summer, 4(3-3) P-M: (ECE 302 and ECE 303 and ECE 305) R: Open only to juniors or seniors or graduate students in the Electrical Engineering major and juniors or seniors in the Computer Engineering major. SA: EE 476
Operational theory, characteristics and applications of optical components, light emitting diodes, lasers, laser diodes, photodetectors, photovoltaics, fiber optics, optical modulators and non-linear optical devices.

477 Microelectronic Fabrication
Fall, 3(2-3) P-M: (ECE 474 or concurrently) R: Open only to juniors or seniors in the Department of Electrical and Computer Engineering. SA: ECE 483
Microelectronic processing fundamentals and simulations. Comparison of current microfabrication technologies and their limitations.

480 Senior Design
Fall, Spring, 3(3-6) P-M: (ECE 303 and ECE 313 and ECE 320 and ECE 331 and ECE 366) or (CSE 410 and CSE 420) and completion of Tier I writing requirement. R: Open only to seniors in the Department of Electrical and Computer Engineering. SA: ECE 481, ECE 482, ECE 483
Electrical engineering and computer engineering senior design experience involving contemporary design tools and practices, engineering standards, ethics, cross-functional teaming, oral and written technical communication, lifelong learning.

484 Applications of Analog Integrated Circuits
Spring, 4(3-3) P-M: (ECE 302 and ECE 303) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering. SA: EE 484
Circuit design using analog integrated circuits. SPICE macromodeling. Operational amplifiers, comparators, timers, regulators, multipliers and converters. Design project with hardware and software verification.

485 Digital Control and Robotics
Spring, 4(3-3) P-M: (ECE 331 and ECE 313) R: Open only to juniors or seniors or graduate students in the Department of Electrical and Computer Engineering. SA: EE 485
Robot classifications, kinematics, trajectory planning, digital controller design. Design and implementation of sensor-based robots.

490 Independent Study
Fall, Spring, Summer, 1 to 3 credits. A student may earn a maximum of 3 credits in all enrollments for this course. R: Approval of department. SA: EE 490
Independent study of a topic in electrical engineering or computer engineering.

491 Special Topics
Fall, Spring, Summer, 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to students in the Department of Electrical and Computer Engineering. SA: EE 491
Investigation of special topics in electrical engineering or computer engineering.

499 Undergraduate Research
Fall, Spring, Summer, 1 to 3 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Approval of department. SA: EE 499
Independent undergraduate research in contemporary areas of electrical engineering or computer engineering.

ENGINEERING

101 Preview of Science
Fall, 1 credit. Interdepartmental with Natural Science; Agriculture and Natural Resources; Social Science; Communication Arts and Sciences. Administered by College of Natural Science. R: Open only to students in the College of Agriculture and Natural Resources or College of Communication Arts and Sciences or College of Social Science. Approval of college.
Environmental issues and problems explored from a variety of perspectives, including legal, scientific, historical, political, socio-economic, and technical points of view.

290 Independent Study
Fall, Spring, Summer, 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to students in the College of Engineering, approval of college.
Independent undergraduate research in engineering.

291 Selected Topics
Fall, Spring, Summer, 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to freshmen or sophomores.
Experimental course development or special topics appropriate for freshmen and sophomores.

300 Technology, Society and Public Policy
Fall, 2(2-0) P-M: Completion of Tier I writing requirement. RB: Two courses in mathematics or engineering or science. SA: EGR 200, EGR 201, EGR 202

393 Engineering Cooperative Education
Fall, Spring, Summer, 1(1-0) A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to students in the College of Engineering.
Pre-professional educational employment experiences in industry and government related to student’s major. Educational employment assignment approved by College of Engineering.