EE F102 Introduction to Electrical and Computer Engineering
3 Credits
Offered Spring
Basic modern devices, concepts, technical skills and instruments of electrical engineering.
Prerequisite: MATH F251X (may be taken concurrently).
Lecture + Lab + Other: 2 + 3 + 0

EE F203 Electric Circuits
4 Credits
Offered Fall
Introduces DC and AC circuit analysis techniques including transient analysis, steady state analysis, three phase circuits and ideal amplifiers.
Prerequisites: MATH F251X; MATH F252X (both MATH F251X and MATH F252X may be taken concurrently); EE F102.
Lecture + Lab + Other: 3 + 3 + 0

EE F204 Electrical Engineering Fundamentals II
4 Credits
Offered Spring
Electronics of solid state devices, amplifier design, digital circuits, electromechanics, control systems and instrumentation.
Prerequisites: MATH F253X (may be taken concurrently); EE F203; MATH F252X.
Lecture + Lab + Other: 3 + 3 + 0

EE F303 Electrical Machinery
4 Credits
Offered Fall
Electromechanical energy conversion principles, characteristics and applications of transformers, synchronous and induction machines, DC machines, and special machines.
Prerequisites: EE F204.
Lecture + Lab + Other: 3 + 3 + 0

EE F311 Engineering Electromagnetics I
3 Credits
Offered Fall
Electromagnetic theory and applications. Static electric fields in free space and material media; steady current systems and associated magnetic effects. Includes electrostatics, magnetostatics, Maxwell’s equations, electromagnetic wave propagation, and transmission lines. Application of the wave equations to engineering systems.
Prerequisites: MATH F302 (may be taken concurrently); EE F204; MATH F253X; PHYS F212X.
Lecture + Lab + Other: 3 + 0 + 0

EE F331 High-frequency Lab
1 Credit
Offered Fall
Laboratory experiments in transmission lines, impedances, bridges, scattering parameters, hybrids and waveguides.
Prerequisite: EE F311.
Lecture + Lab + Other: 0 + 3 + 0

EE F333 Electronic Devices (W)
4 Credits
Offered Fall
An introduction to the properties of semiconductors and the analysis of electronics and electrical devices including diodes, field effect transistors (FETs), bipolar junction transistors (BJTs). Large signal and small signal analysis techniques, and common electrical circuit topologies.
Prerequisites: EE F204; WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X.
Lecture + Lab + Other: 3 + 3 + 0

EE F334 Electronic Circuit Design
4 Credits
Offered Spring
Application of semiconductor devices in circuit design in computation, automatic control and communication.
Prerequisites: EE F333.
Lecture + Lab + Other: 3 + 3 + 0

EE F341 Digital and Computer Analysis and Design
4 Credits
Offered Fall
Modular structure of computer systems. Analysis, design and implementation of combinational and sequential logic machines. Introduction to microprocessor architecture and microprocessor programming. Design with traditional and hardware description language techniques.
Prerequisites: CS F201; one year of college physics.
Lecture + Lab + Other: 3 + 3 + 0

EE F343 Digital Systems Analysis and Design
4 Credits
Offered Fall
Fundamental principles and practices of digital design. Analysis, design and implementation of combinational and sequential logic machines. Introduction to microprocessor architecture and microprocessor programming. Analysis of digital data transmission techniques and microprocessor interfacing. Design with traditional and hardware description language techniques. Implementation with both medium and large scale integrated (M/LSI) chips and programmable logic devices (PLDs).
Prerequisites: ES F201 or CS F201; EE F204; EE F333 (may be taken concurrently).
Lecture + Lab + Other: 3 + 3 + 0

EE F353 Circuit Theory
3 Credits
Offered Fall
Transfer functions, passive and active filters, Laplace transforms and applications, introduction to Fourier series and transforms and two port networks.
Prerequisites: MATH F302 (may be taken concurrently); EE F204; ES F201 or CS F201; MATH F253X.
Lecture + Lab + Other: 3 + 0 + 0

EE F354 Engineering Signal Analysis
3 Credits
Offered Spring
Prerequisites: EE F353; MATH F302.
Lecture + Lab + Other: 3 + 0 + 0
EE F404 Electrical Power Systems
4 Credits
Offered Spring
Electrical power transmission and distribution systems, power flow, symmetrical faults, and economic dispatch with computer-aided analysis.
Prerequisites: EE F303.
Lecture + Lab + Other: 3 + 3 + 0

EE F406 Electrical Power Engineering
4 Credits
Offered Fall
Economic operation of power systems, symmetrical and unsymmetrical faults, power system protection, dynamic power system stability, and computer-aided fault and transient stability analysis.
Prerequisites: EE F404.
Lecture + Lab + Other: 3 + 3 + 0

EE F408 Power Electronics Design
(O, W)
4 Credits
Offered Spring
Analysis and design of power electronic conversion, control and drive systems. Topics will include the theory and application of thyristors, rectifiers, DC-DC converters, inverters, resonant converters, AC and DC switches and regulators, power supplies, DC drives and adjustable-speed drives, including variable-frequency drives. Includes laboratory exercises using power electronic converter boards, PSPICE, and a complete power electronics design project.
Prerequisites: WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X; COJO F131X or COJO F141X; EE F303; EE F334; EE F354; senior standing.
Stacked with EE F608.
Lecture + Lab + Other: 3 + 3 + 0

EE F412 Engineering Electromagnetics II
3 Credits
Use of Maxwell’s equations in analysis of plane wave propagation, wave reflection, radiation and antennas, waveguides, cavity resonators, transmission lines and radio propagation.
Prerequisites: EE F311; EE F331; MATH F302.
Lecture + Lab + Other: 3 + 0 + 0

EE F432 Electromagnetics Laboratory
1 Credit
Laboratory experiments with microwave sources, propagating electromagnetic waves, waveguides and antennas. Design, construction and testing of antenna systems.
Corequisites: EE F412.
Lecture + Lab + Other: 0 + 3 + 0

EE F443 Computer Engineering Analysis and Design
4 Credits
Offered Spring
Advanced digital design, and principles and practices of computer engineering. Analysis and design of computer architecture and organization. Digital signal processing techniques and hardware. Microprocessor operation, control and interfacing. Design with traditional and hardware description language techniques. Implementation with both medium and large scale integrated (M/LSI) chips and programmable logic devices (PLDs).
Prerequisites: EE F341 or EE F343.
Lecture + Lab + Other: 3 + 3 + 0

EE F444 Embedded Systems Design
(O, W)
4 Credits
Offered Spring
Issues surrounding the design and implementation of microcontroller-based embedded systems. Topics include hardware architecture and glue logic, embedded programs design, analysis, and optimization, hardware/firmware partitioning, firmware architecture and design. Includes laboratory exercises using evaluation board and a complete embedded system design project. Emphasis on robust designs, energy efficiency, and proper documentation.
Prerequisites: COJO F131X or COJO F141X; EE F343 or EE F341; EE F354; EE F443; WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X; senior standing.
Recommended: CS F301.
Stacked with EE F645.
Lecture + Lab + Other: 3 + 3 + 0

EE F451 Digital Signal Processing
4 Credits
Offered Fall
Time, frequency and Z-transformation domain analysis of discrete time systems and signals; discrete Fourier transformation (DFT) and FFT implementations; FIR/IIR filter design and implementation techniques; discrete time random signals and noise analysis; quantization and round off errors; and spectral analysis. Includes applications to medical, speech, electromagnetic and acoustic signal analysis.
Prerequisites: EE F354.
Stacked with EE F651.
Lecture + Lab + Other: 3 + 3 + 0

EE F461 Communication Systems
4 Credits
Offered Fall
Theory, design and implementation of communication systems. Measurement of modulation, noise, channel spectrum, satellite link budget and microwave path design.
Prerequisites: EE F354; senior standing.
Lecture + Lab + Other: 3 + 3 + 0

EE F463 Communication Networks
3 Credits
Offered Spring
Prerequisites: EE F354 and Senior standing.
Lecture + Lab + Other: 3 + 0 + 0

EE F464 Communication Networks Design
(O, W)
4 Credits
Offered Spring
Prerequisites: COJO F131X or COJO F141X; EE F354; WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or WRTG F214X; senior standing.
Lecture + Lab + Other: 3 + 3 + 0
EE F471  Automatic Control
3 Credits
Offered Spring
Linear system representation by transfer functions, signal flow
graphs and state equations. Feedback, time and frequency response
of linear systems. Stability analysis by Routh-Hurwitz criterion and
domain methods. Specifications of higher order linear systems.
System design and compensation.
Prerequisites: EE F353; MATH F302.
Lecture + Lab + Other: 3 + 0 + 0

EE F488  Undergraduate Research
1-3 Credits
Advanced research topics from outside the usual undergraduate
requirements.
Prerequisites: Permission of instructor.
Recommended: A substantial level of technical/scientific background.
Lecture + Lab + Other: 0 + 0 + 0

EE F608  Power Electronics Design  (O, W)
4 Credits
Offered Spring
Analysis and design of power electronic conversion, control and drive
systems. Topics will include the theory and application of thyristors,
rectifiers, DC-DC converters, inverters, resonant converters, AC and DC
switches and regulators, power supplies, DC drives and adjustable-speed
drives, including variable-frequency drives. Includes laboratory exercises
using power electronic converter boards, PSPICE, and a complete power
electronics design project.
Prerequisites: WRTG F111X; WRTG F211X, WRTG F212X, WRTG F213X or
WRTG F214X; COJO F131X or COJO F141X; EE F303; EE F334; EE F354;
senior standing.
Stacked with EE F408.
Lecture + Lab + Other: 3 + 3 + 0

EE F611  Waves
3 Credits
Offered Spring Odd-numbered Years
Introduction to waves and wave phenomena. Includes
electromagnetic, acoustic, seismic, atmospheric and water waves and their
mathematical and physical treatment in terms of Hamilton’s principle.
Accelerates propagation, attenuation, reflection, refraction, surface and laminal
guiding, dispersion, energy density, power flow, and phase and group
velocities. Treatment limited to plane harmonic waves in isotropic media.
Prerequisites: MATH F302 or MATH F421.
Lecture + Lab + Other: 3 + 0 + 0

EE F634  Microwave Design I
3 Credits
Offered Fall Odd-numbered Years
Analysis, design, fabrication and measurement of passive microwave
components and circuits using microstrip construction techniques.
Theoretical and computer-aided design of transmission lines, power
dividers, hybrids, directional couplers and filters.
Prerequisites: EE F334; EE F412; EE F432.
Lecture + Lab + Other: 2 + 3 + 0

EE F635  Microwave Design II
3 Credits
Offered Spring Even-numbered Years
Analysis and design of solid-state microwave circuits. Amplifier
and oscillator circuits are designed and fabricated using microstrip
construction techniques and computer-aided design tools.
Prerequisites: EE F634.
Lecture + Lab + Other: 2 + 3 + 0

EE F643  Advanced Architectures for Parallel Computing
3 Credits
Offered Fall Odd-numbered Years
This course covers massively parallel computer architectures and
their application for computationally intensive engineering problems.
Fundamental hardware concepts and issues in designing such systems
are introduced. Compute Unified Device Architecture (CUDA), developed
by NVIDIA for the compute engines in their graphic processing units
(GPUs), will be used as an example and a practical platform for student
assignments. Through assignments and a project students will learn
simulation, computational engineering, convolution, correlation, filtering,and
similar problems of particular interest to engineering students.
Prerequisites: CS F201 or ES F201; EE F443 graduate standing.
Lecture + Lab + Other: 3 + 0 + 0

EE F645  Embedded Systems Design
4 Credits
Offered Spring
Issues surrounding the design and implementation of microcontroller-
based embedded systems. Topics include hardware architecture and
software logic, embedded programs design, analysis, and optimization,
hardware/ firmware partitioning, firmware architecture and design.
Includes laboratory exercises using evaluation board and a complete
embedded system design project. Emphasis on robust designs, energy
efficiency, and proper documentation.
Prerequisites: Graduate standing.
Stacked with EE F444.
Lecture + Lab + Other: 3 + 3 + 0

EE F646  Wireless Sensor Networks
3 Credits
Offered Fall Even-numbered Years
The course will survey the area of networked sensors, with a special
focus on low-power wireless sensor networks. Topics covered will include
communication standards and protocols for sensor networks, embedded
operating systems, applications, collaborative processing, data fusion,
and system architecture. Students will undertake a theoretical or
practical research project.
Prerequisites: CS F201 or ES F201; EE F343 or EE F341; graduate
standing.
Lecture + Lab + Other: 3 + 0 + 0

EE F647  Data Compression
3 Credits
Offered Spring Even-numbered Years
Study of algorithms and techniques that reduce information storage
and transmission requirements. Both lossless and lossy techniques
will be studied including: Huffman coding, arithmetic coding, image
compression, and transform techniques.
Prerequisites: ES F201 or CS F201.
Lecture + Lab + Other: 3 + 0 + 0

EE F648  VLSI Design
3 Credits
Offered Spring Odd-numbered Years
Study of methods to integrate millions of transistors on a single chip
and create optimized design. Topics include CMOS logic design, power
and timing issues. VLSI architectures, and full custom layout. Students will
use CAD tools to implement a VLSI design.
Prerequisite: EE F343.
Lecture + Lab + Other: 3 + 0 + 0
## EE F651  Digital Signal Processing

4 Credits  
Offered Fall  
Time, frequency and Z-transformation domain analysis of discrete time systems and signals; discrete Fourier transformation (DFT) and FFT implementations; FIR/IIR filter design and implementation techniques; discrete time random signals and noise analysis; quantization and round off errors; and spectral analysis. Includes applications to medical, speech, electromagnetic and acoustic signal analysis.  
**Prerequisites:** Graduate standing.  
**Stacked with:** EE F451.  
**Lecture + Lab + Other:** 3 + 3 + 0

## EE F655  Adaptive Filters

3 Credits  
Offered Spring Even-numbered Years  
Study to self-designing filters which recursively update depending on the statistics of the input data for optimum performance. Topics will include foundational material in probability of stochastic processes, spectral analysis, linear optimum filtering. Wiener-Hopf filters, Yule-Walker equations, forward and backward linear predictors, method of steepest descent, least squares techniques, and auto-regressive filters.  
**Prerequisites:** EE F451.  
**Lecture + Lab + Other:** 3 + 0 + 0

## EE F656  Aerospace Systems Engineering

3 Credits  
Offered Fall Odd-numbered Years  
A multidisciplinary team of students will perform a preliminary design study of a major aerospace system. Design considerations will include requirements for project management, aerospace vehicle design, power, attitude control, thermal control, communications, computer control and data handling. The students will present their final design in a written report and a public seminar.  
**Prerequisites:** Graduate standing.  
**Cross-listed with:** ME F656.  
**Lecture + Lab + Other:** 3 + 0 + 0

## EE F662  Digital Communication Theory

3 Credits  
Offered Fall Even-numbered Years  
Probability in communication systems, power spectral density, baseband formatting, bandpass modulation and demodulation, link analysis, coding and channel models. Sections of this course offered in Anchorage have an additional fee.  
**Prerequisites:** EE F461.  
**Lecture + Lab + Other:** 3 + 0 + 0

## EE F671  Digital Control Systems

3 Credits  
Offered As Demand Warrants  
Study of digital control theory. Topics will include signal conversion, Z-transforms, state variable techniques, stability, time and frequency domain analysis and system design.  
**Prerequisites:** EE F471.  
**Lecture + Lab + Other:** 3 + 0 + 0

## EE F698  Non-Thesis Research/Project

1-6 Credits  
**Lecture + Lab + Other:** 0 + 0 + 0

## EE F699  Thesis

1-12 Credits  
**Lecture + Lab + Other:** 0 + 0 + 0