ILLINOIS INSTITUTE OF TECHNOLOGY (IIT)

IIT 105 | INTRODUCTION TO COMPUTER PROGRAMMING I | 3-4.5 quarter hours
(Undergraduate)
Introduces the use of high-level programming language (C/C++) as a problem-solving tool including basic data structures and algorithms, structured programming techniques, and software documentation. Designed for students who have had little or no prior experience with computer programming. (Taught at Illinois Institute of Technology as CS 105.) (3 quarter hours)

IIT 115 | ENGINEERING GRAPHICS AND DESIGN | 3 quarter hours
(Undergraduate)
Basic traditional and computer-based techniques and applications, multiview sketching, orthographic projection, isometric and oblique pictorials, sectioning, auxiliary views, principles of descriptive geometry, dimensioning, detail drawings, introduction to design and computer-aided drafting and design (CAD). (Taught at Illinois Institute of Technology as EG 105.) (3 quarter hours)

IIT 200 | INTRODUCTION TO C++ PROGRAMMING | 4.5 quarter hours
(Undergraduate)
Problem-solving and program design using C++. Introduces a variety of programming techniques, algorithms, and basic data structures-including an introduction to object-oriented programming. (Taught at Illinois Institute of Technology as CS 200). (4.5 quarter hours)

IIT 201 | MECHANICS OF SOLIDS I | 4.5 quarter hours
(Undergraduate)
Free body diagrams. Equilibrium of a particle, a system of particles, and a rigid body. Distributed forces, centroids, centers of gravity, and moments of inertia. Analysis of structures. Friction. Internal loads in bars, shafts and beams. Stress and strain in axially loaded members. (Taught at Illinois Institute of Technology as MMAE 201.) (4.5 quarter hours)

IIT 202 | MECHANICS OF SOLIDS II | 4.5 quarter hours
(Undergraduate)
Stress and strain relations, mechanical properties. Axially loaded members. Torsion of circular shafts. Plane stress and strain, Mohr's circle, stress transformation. Elementary bending theory, normal and shear stresses in beams, beam deflection. Combined loading. (Taught at Illinois Institute of Technology as MMAE 202.) (4.5 quarter hours)

IIT 203 | INTRODUCTION TO MECHANICS | 4.5 quarter hours
(Undergraduate)
Equilibrium concepts. Statics of a particle. Statics of a system of particles and rigid bodies. Distributed forces, centroids and center of gravity. Friction. Kinetics of particles: Newton's Laws of motion, energy and momentum. Kinematics of particles. Dynamics of rotating bodies (Taught at IIT as MMAE 200). (4.5 quarter hours)

IIT 210 | CIRCUIT ANALYSIS I | 4.5-6 quarter hours
(Undergraduate)
Ohm's Law, Kirchoff's Laws, and network element voltage-current relations. Application of mesh and nodal analysis to circuits. Dependent sources, operational amplifier circuits, superposition, Thevenin's and Norton's Theorems, maximum power transfer theorem. Transient circuit analysis for RC, RL, and RLC circuits. Introduction to Laplace Transforms. Concurrent registration in ECE 212 and ECE 218 is strongly encouraged. (Taught at Illinois Institute of Technology as ECE 211. Updated Dec 2015 to reflect change to 3.0 semester hr at IIT) (4.5 quarter hours)

IIT 211 | MATERIALS SCIENCE | 4.5 quarter hours
(Undergraduate)
The scientific principles determining the structure of metallic, polymeric, ceramic semiconductor and composite materials; electronic structure, atomic bonding, atomic structure, microstructure and macrostructure. The basic principles of structure-property relationships in the context of chemical, mechanical, and physical properties of materials. (Taught at Illinois Institute of Technology as MS 201.) (4.5 quarter hours)

IIT 212 | ANALOG AND DIGITAL LABORATORY | 1.5 quarter hours
(Undergraduate)
Basic experiments with analog and digital circuits; familiarization with test and measurement equipment; combinational digital circuits; familiarization with latches, flip-flops, and shift registers; operational amplifiers; and transient effects in first-order and second-order analog circuits; PSpice software applications. (Taught at Illinois Institute of Technology as ECE 212) (1.5 quarter hours)

IIT 213 | CIRCUIT ANALYSIS II | 6 quarter hours
(Undergraduate)
Circuit Analysis II Sinusoidal excitation and phasors. AC steady-state circuit analysis using phasors. Complex frequency, network functions, pole-zero analysis, frequency response, and resonance. Two-port networks, transformers, mutual inductance, AC steady-state power, RMS values, introduction to three-phase systems and Fourier series. Concurrent registration in ECE 214 is strongly encouraged. (Taught at Illinois Institute of Technology as ECE 213) (6 quarter hours)

IIT 214 | ANALOG & DIGITAL LAB II | 1.5 quarter hours
(Undergraduate)
Design-oriented experiments including counters, finite state machines, sequential logic design, impedances in AC steady-state, resonant circuits, two-port networks, and filters. A final project incorporating concepts from analog and digital circuit design will be required. (Taught at Illinois Institute of Technology as ECE 214) (1.5 quarter hours)

IIT 218 | DIGITAL SYSTEMS | 6 quarter hours
(Undergraduate)
Number systems and conversions, binary codes, and Boolean algebra. Switching devices, discrete and integrated digital circuits, analysis and design of combinational logic circuits. Karnaugh maps and minimization techniques. Counters and registers. Analysis and design of synchronous sequential circuits. (Taught at IIT as ECE 218) Was previously 4.5 hr, changed to 6.0 hr in August 2015 to reflect change in IIT. (6 quarter hours)

IIT 232 | DESIGN FOR INNOVATION | 4.5 quarter hours
(Undergraduate)
Product design and development including engineering design, good versus bad design, human-centered design, sketch models and prototyping, material selection, sustainable product development, product tear down, and product architecture. Global topics encompassing intellectual property, innovative thinking, global competitiveness, business economics, and managing product development (Taught at IIT as MMAE 232). (4.5 quarter hours)

IIT 242 | DIGITAL COMPUTERS & COMPUTING | 4.5 quarter hours
(Undergraduate)
Basic concepts in computer architecture, organization, and programming, including: integer and floating point number representations, memory organization, computer processor operation (the fetch/execute cycle), and computer instruction sets. Programming in machine language and assembly language with an emphasis on practical problems. Brief survey of different computer architectures. (Taught at Illinois Institute of Technology as ECE 242) (4.5 quarter hours)

IIT 252 | INTRODUCTION TO DIFFERENTIAL EQUATIONS | 6 quarter hours (Undergraduate)
Linear differential equations of order one. Linear differential equations of higher order. Series solutions of linear DE. Laplace transforms and their use in solving linear DE. Introduction to matrices. Systems of linear differential equations. (Taught at Illinois Institute of Technology as MATH 252) (6 quarter hours)

IIT 271 | ENGINEERING MATERIALS AND DESIGN | 4.5 quarter hours (Undergraduate)
Mechanical behavior of metals, polymers, ceramics and composites, laboratory testing methods including tension, torsion, hardness, impact, toughness, fatigue and creep. Evaluation of structural performance in terms of material processing, service conditions and design. (Taught at Illinois Institute of Technology as MMAE 271.) (4.5 quarter hours)

IIT 300 | INSTRUMENTATION LAB | 4.5 quarter hours (Undergraduate)
Basic electronic skills for scientific research. Electrical measurements, basic circuit analysis, diode and transistor circuits. Transistor and integrated amplifiers, filters, and power circuits. Basics of digital circuits, including Boolean algebra and design of logic circuits. (Taught at Illinois Institute of Technology as PHYS 300) (4.5 quarter hours)

IIT 301 | COMMUNICATION ELECTRONICS | 4.5 quarter hours (Undergraduate)
Radio frequency AM, FM, and PM transmitter and receiver principles. Design of mixers, oscillators, impedance matching networks, filters, phase-locked loops, tuned amplifiers, power amplifiers, and crystal circuits. Nonlinear effects, intermodulation distortion, and noise. Transmitter and receiver design specification. Credit will be given for either ECE 401 or ECE 409, but not for both. (Taught at IIT as ECE 401) (4.5 quarter hours)

IIT 302 | ADVANCED MECHANICS OF SOLIDS | 4.5 quarter hours (Undergraduate)
Analysis of stress and strain. Torsional and bending structural elements. Energy methods and Castigliano's theorems. Curved beams and springs. Thick-walled cylinders and spinning disks. Pressure vessels. Contact stresses. Stability of columns. Stress concentration and stress intensity factors. Theories of failure, yield, and fracture. Fatigue. (Taught at Illinois Institute of Technology as MMAE 302.) (4.5 quarter hours)

IIT 303 | MECHANICS OF SOLIDS III | 4.5 quarter hours (Undergraduate)
Analysis of stress and strain. Design of torsional and bending structural elements. Energy methods. Curved beams. Thick-walled cylinders, spinning disks. Stability of columns. Stress concentration, stress intensity factors, fractures toughness. Fatigue. Theories of failure and yield. Design applications. (Taught at Illinois Institute of Technology as MMAE 303.) (4.5 quarter hours)

IIT 304 | MECHANICS OF AEROSTRUCTURES | 4.5 quarter hours (Undergraduate)
Loads on aircraft, and flight envelope. Stress, strain and constitutive relations. Torsion of open, closed and multi-cell tubes. Energy methods. Castigliano's theorems. Structural instability. (Taught at Illinois Institute of Technology as MMAE 304) (4.5 quarter hours)

IIT 305 | DYNAMICS | 4.5 quarter hours (Undergraduate)
Kinematics of particles. Kinetics of particles: Newton's laws of motion, energy; momentum. Systems of particles. Kinematics of rigid bodies. Plane motion of rigid bodies: forces and accelerations, energy, momentum. (Taught at Illinois Institute of Technology as MMAE 305.) (4.5 quarter hours)

IIT 306 | MECHANICS OF SOLIDS AND DESIGN | 4.5 quarter hours (Undergraduate)
Analysis of stress and strain. Torsional and bending structural elements. Energy methods and Castigliano's theorems. Curved beams and springs. Thick-walled cylinders and spinning disks. Pressure vessels, contact stresses, stability of columns, stress concentration and stress intensity factors. Theories of failure, yield and fracture. Fatigue. Design of shafts, beams and springs. Design of gears and bearings. (Taught at Illinois Institute of Technology as MMAE 306) (4.5 quarter hours)

IIT 307 | ELECTRODYNAMICS | 6 quarter hours (Undergraduate)
Analysis of circuits using distributed network elements. Response of transmission lines to transient signals. AC steady-state analysis of lossless and lossy lines. The Smith Chart as an analysis and design tool. Impedance matching methods. Vector analysis applied to static and time-varying electric and magnetic fields. Coulomb's Law, electric field intensity, flux density and Gauss's Law. Energy and potential. Biot-Savart and Ampere's Law. Maxwell's equations with applications including uniform-plane wave propagation. (Taught at IIT as ECE 307)

IIT 308 | SIGNALS AND SYSTEMS | 4.5 quarter hours (Undergraduate)
Time and frequency domain representation of continuous and discrete time signals. Introduction to sampling and sampling theorem. Time and frequency domain analysis of continuous and discrete linear systems. Fourier series convolution, transfer functions. Fourier transforms, Laplace transforms, and Z-transforms. (Taught at Illinois Institute of Technology as ECE 308) (4.5 quarter hours)

IIT 310 | FLUID MECHANICS WITH LABORATORY | 6 quarter hours (Undergraduate)
Basic properties of fluids in motion. Lagrangian and Eulerian viewpoints, material derivative, streamlines, etc. Continuity, energy and linear and angular momentum equations in integral and differential forms. Integration of equations for one-dimensional flows and application to problems. Incompressible viscous flow; Navier-Stokes equations, parallel flow, pipe flow, and the Moody diagram. Introduction to laminar and turbulent boundary layers and free surface flows. Lab Component: Introduction to measurements of fluid properties and basic features of fluid flows; flow through pipes and channels, flow-induced forces on bodies; First Law of Thermodynamics; six laboratory experiments in small groups supplemented by demonstrations and films. (Taught at Illinois Institute of Technology as MMAE 310.) (4.5 quarter hours)

IIT 311 | COMPRESSIBLE FLOW | 4.5 quarter hours (Undergraduate)
Regimes of compressible perfect-gas flow. Steady, quasi one-dimensional flow in passages. Effects of heat addition and friction in ducts. Design of nozzles, diffusers and wind tunnels. Simple waves and shocks in unsteady duct flow. Steady two-dimensional supersonic flow including oblique shocks and Prandtl-Meyer expansions. (Taught at Illinois Institute of Technology as MMAE 311) (4.5 quarter hours)

IIT 312 | AERODYNAMICS OF AEROSPACE VEHICLES | 4.5 quarter hours (Undergraduate)
Analysis of aerodynamic lift and drag forces on bodies. Potential flow calculation of lift on two-dimensional bodies: numerical solutions; source and vortex panels. Boundary layers and drag calculations. Aerodynamic characteristics of airfoils; the finite wing. (Taught at Illinois Institute of Technology as MMAE 312) (4.5 quarter hours)

IIT 313 | ENGINEERING ELECTRONICS | 6 quarter hours
(Undergraduate)
Physics of semiconductor devices. Diode operation and circuit applications. Regulated power supplies. Bipolar and field-effect transistor operating principles. Biasing techniques and stabilization. Linear equivalent circuit analysis of bipolar and field-effect transistor amplifiers. Laboratory experiments reinforce concepts. (Taught at Illinois Institute of Technology as ECE 311) (6 quarter hours)

IIT 314 | ELECTRONIC CIRCUITS | 6 quarter hours
(Undergraduate)
Analysis and design of amplifier circuits. Frequency response of transistor amplifiers. Feedback amplifiers. Operational amplifiers: internal structure, characteristics and applications. Stability and compensation. Laboratory experiments reinforce concepts. (Taught at Illinois Institute of Technology as ECE 312) (6 quarter hours)

IIT 315 | FLUID MECHANICS | 4.5 quarter hours
(Undergraduate)
Basic properties of fluids in motion. Langrangian and Eulerian viewpoints, materials derivative, streamlines, etc. Continuity, energy, and linear and angular momentum equations in integral and differential forms. Integration of equations for one-dimensional forms and application to problems. Incompressible viscous flow; Navier-Stokes equations, parallel flow, pipe flow, and the Moody diagram. Introduction to laminar and turbulent boundary layers and free surface flows (Taught at IIT as MMAE 313). (4.5 quarter hours)

IIT 316 | ELECTRIC MOTOR DRIVES | 6 quarter hours
(Undergraduate)
Fundamentals of electric motor drives are studied. Applications of semiconductor switching circuits to adjustable speed drives, robotic, and traction are explored. Selection of motor drives, calculating the ratings, speed control, position control, starting, and braking are also covered. Simulation mini-projects and lab experiments are based on the lectures given. (Taught at Illinois Institute of Technology as ECE 412.) (6 quarter hours)

IIT 317 | INTRODUCTION TO COMPUTER NETWORKS WITH LABORATORY | 6 quarter hours
(Undergraduate)
Emphasis on the physical, data link, and medium access layers of the OSI architecture. Different general techniques for networking tasks, such as error control, flow control, multiplexing, switching, routing, signaling, congestion control, traffic control, scheduling will be covered along with their experimentation and implementation in a laboratory. (Taught at Illinois Institute of Technology as ECE 407) (6 quarter hours)

IIT 318 | INTRODUCTION TO COMPUTER NETWORKS | 4.5 quarter hours
(Undergraduate)
Emphasis on the physical, data link and medium access layers of the OSI architecture. Different general techniques for networking tasks, such as error control, flow control, multiplexing, switching, routing, signaling, congestion control, traffic control, scheduling will be covered. (Taught at Illinois Institute of Technology as ECE 408.) (4.5 quarter hours)

IIT 319 | FUNDAMENTALS OF POWER ENGINEERING [CORRESPONDS TO ECE 319] | 6 quarter hours
(Undergraduate)
Principles of electromechanical energy conversion. Fundamentals of the operation of transformers, synchronous machines, induction machines, and fractional horsepower machines. Introduction to power network models and per-unit calculations. Gauss-Siedel load flow. Lossless economic dispatch. Symmetrical three-phase faults. Laboratory considers operation, analysis and performance of motors and generators. The laboratory experiments also involve use of PC-based interactive graphical software for load flow, economic dispatch, and fault analysis. (Taught at Illinois Institute of Technology as ECE 319) (6 quarter hours)

IIT 320 | THERMODYNAMICS | 4.5 quarter hours
(Undergraduate)
Introduction to thermodynamics including properties of matter. First Law of Thermodynamics; and its use in analyzing open and closed systems; limitations of the Second Law of thermodynamics; entropy. (Taught at Illinois Institute of Technology as MMAE 320.) (4.5 quarter hours)

IIT 321 | APPLIED THERMODYNAMICS | 4.5 quarter hours
(Undergraduate)
Second-law analysis of engineering systems. Chemical Equilibrium. Thermodynamics of non-reacting systems. Water-air mixtures. Phase diagrams. Thermodynamics of reacting systems. Combustion. Fuel cells. Analysis and design of refrigeration and power generation systems. (Taught at Illinois Institute of Technology as MMAE 321.) (4.5 quarter hours)

IIT 322 | HEAT AND TRANSFER | 6 quarter hours
(Undergraduate)
Basic laws of transport phenomena. Similarity relations and analogies. Steady-state heat conduction; heat generation and extended surfaces. Multi-dimensional and transient heat conduction. Numerical and graphical analysis. Fundamentals and empirical relations of forced and natural convection. Radiation concepts, networks, solar energy. Combined effects. Lab component: Introduction to thermal science measurements; combustion, thermodynamics cycles, conduction, convection and radiation heat transfer. Six laboratory experiments in small groups. (Taught at Illinois Institute of Technology as MMAE 322.) (6 quarter hours)

IIT 323 | MICROWAVE CIRCUITS AND SYSTEMS WITH LABORATORY | 6 quarter hours
(Undergraduate)
Maxwell's equations, waves in free space, metallic and dielectric waveguides, microstrips, microwave cavity resonators and components, ultra-high frequency generation and amplification. Analysis and design of microwave circuits and systems. (Taught at IIT as ECE 423) (6 quarter hours)

IIT 324 | HEAT AND MASS TRANSFER | 4.5 quarter hours
(Undergraduate)
Basic laws of transport phenomena, including: steady-state heat conduction; multi-dimensional and transient conduction; forced internal and external convection; natural convection; heat exchanger design and analysis; fundamental concepts of radiation; shape factors and network analysis; diffusive and convective mass transfer; phase change, condensation and boiling. (Taught at Illinois Institute of Technology as MMAE 323.) (4.5 quarter hours)

IIT 325 | ANALYSIS AND DESIGN OF INTEGRATED CIRCUITS | 4.5 quarter hours
(Undergraduate)
Contemporary analog and digital integrated circuit analysis and design techniques. Bipolar, CMOS and BICMOS IC fabrication technologies, IC Devices and Modeling, Analog ICs including multiple-transistor amplifiers, biasing circuits, active loads, reference circuits, output buffers; their frequency response, stability and feedback consideration. Digital ICs covering inverters, combinational logic gates, high-performance logic gates, sequential logics, memory and array structures. Team design projects. (Taught at IIT as ECE 425) (4.5 quarter hours)

IIT 329 | INTRODUCTION TO VLSI DESIGN | 6 quarter hours
(Undergraduate)
Processing, fabrication, and design of Very Large Scale Integration (VLSI) circuits. MOS transistor theory, VLSI processing, circuit layout, layout design rules, layout analysis, and performance estimation. The use of computer-aided design (CAD) tools for layout design, system design in VLSI, and application-specific integrated circuits (ASICs). In the laboratory, students create, analyze, and simulate a number of circuit layouts as design projects, culminating in a term design project. (Taught at IIT as ECE 429) (6 quarter hours)

IIT 330 | ENGINEERING MEASUREMENTS | 6 quarter hours
(Undergraduate)
Introduction to applications of measurement instrumentation and design of engineering experiments. Generalized characteristics of sensors and measurements systems. Signal conditioning and computer-based data acquisition and analysis. Measurement of motion, force, strain, torque, shaft power, pressure, sound, flow, temperature and heat flux. Design of experiments proposals. Team-based projects addressing application of engineering measurements to a variety of engineering problems. Effective communication of experimental results. (Taught at Illinois Institute of Technology as MMAE 430.) (6 quarter hours)

IIT 331 | POWER ELECTRONICS | 6 quarter hours
(Undergraduate)
Power electronic circuits and switching devices such as power transistors, MOSFET's, SCR's, GTO's, IGBT's and UJT's are studied. Their applications in AC/DC DC/DC, DC/AC and AC/AC converters as well as switching power supplies are explained. Simulation mini-projects and lab experiments emphasize power electronic circuit analysis, design and control. (Taught at Illinois Institute of Technology as ECE 411.) (6 quarter hours)

IIT 332 | DESIGN OF MECHANICAL SYSTEMS | 4.5 quarter hours
(Undergraduate)
Small-group design projects drawn from industry. (Taught at Illinois Institute of Technology as MMAE 432) (4.5 quarter hours)

IIT 333 | DESIGN OF THERMAL SYSTEM | 4.5 quarter hours
(Undergraduate)
Application of principles of fluid mechanics, heat transfer, and thermodynamics to design of components of engineering systems. Examples are drawn from power generation, environmental control, air and ground transportation, and industrial processes, as well as other industries. Groups of students work on projects for integration of these components and design of thermal systems. (Taught at Illinois Institute of Technology as MMAE 433) (4.5 quarter hours)

IIT 334 | MATRIX ALGEBRA AND COMPLEX VARIABLES | 4.5 quarter hours
(Undergraduate)
Vectors and matrices; matrix operations, transpose, rank, inverse; determinants; solution of linear systems; eigenvalues and eigenvectors. The complex plane; analytic functions; contour integrals; Laurent series expansions; singularities and residues. (Taught at Illinois Institute of Technology as MATH 333) (4.5 quarter hours)

IIT 335 | DESIGN OF MACHINE ELEMENTS | 4.5 quarter hours
(Undergraduate)
Students will gain an understanding of the basic elements used in machine design. These include the characteristics of gears, bearings, shafts, keys, couplings, fasteners, springs, electric motors, brakes and clutches, and flexible elements. Students will also learn mechanism types, linkage analysis, and kinematic synthesis. (Taught at Illinois Institute of Technology as MMAE 332.) (4.5 quarter hours)

IIT 336 | DESIGN OF AEROSPACE VEHICLES I | 4.5 quarter hours
(Undergraduate)
The focus of this course is on applications ranging from commercial to military and from manpowered to high-speed to long-duration aircraft. Students will examine aircraft design including aerodynamic, structural and powerplant characteristics to achieve performance goals. The quarter project is a collaborative effort in which small design groups complete the preliminary design cycle of an aircraft to achieve specific design requirements. (Taught at Illinois Institute of Technology as MMAE 436) (4.5 quarter hours)

IIT 337 | DIGITAL SIGNAL PROCESSING I | 4.5-6 quarter hours
(Undergraduate)
Discrete-time system analysis, discrete convolution and correlation, Ztransforms. Realization and frequency response of discrete-time systems, properties of analog filters, IIR filter design, FIR filter design. Discrete Fourier Transforms. Applications of digital signal processing. (Taught at IIT as ECE 436-with lab, or ECE 437-without lab.) (4.5 quarter hours)

IIT 338 | CONTROL SYSTEMS | 4.5 quarter hours
(Undergraduate)
Signal-flow graphs and block diagrams. Types of feedback control. Steady-state tracking error. Stability and Routh Hurwitz criterion. Transient response and time domain design via root locus methods. Frequency domain analysis and design using Bode and Nyquist methods. Introduction to state-variable descriptions. Credit will be given for either ECE 438 or ECE 434, but not for both. (Taught at IIT as ECE 438) (4.5 quarter hours)

IIT 339 | DESIGN OF AEROSPACE VEHICLES II | 4.5 quarter hours
(Undergraduate)
Spacecraft systems design including mission analysis and astrodynamics, launch vehicle requirements, attitude determination and control, propulsion, structural design, power systems thermal management, and telecommunications. Semester-long project is focused on the integration of multiple systems into a coherent spacecraft design to achieve specific mission requirements. (Taught at IIT as MMAE 437). (4.5 quarter hours)

IIT 340 | FUNDAMENTALS OF SEMICONDUCTOR DEVICES | 4.5 quarter hours
(Undergraduate)
The goals of this course are to give the student an understanding of the physical and operational principles behind important electronic devices such as transistors and solar cells. Semiconductor electron and hole concentrations, carrier transport, and carrier generation and recombination are discussed. P-N junction operation and its application to diodes, solar cells, and LEDs are developed. The field-effect transistor (FET) and bipolar junction transistor (BJT) are then discussed and their terminal operation developed. Application of transistors to bipolar and CMOS analog and digital circuits is introduced. (Taught at Illinois Institute of Technology as ECE 430.) (4.5 quarter hours)

IIT 341 | SPACECRAFT AND AIRCRAFT DYNAMICS | 4.5 quarter hours
(Undergraduate)
Kinematics and dynamics of particles, systems of particles, and rigid bodies; translating and rotating reference frames; Euler angles. Aircraft longitudinal and lateral static stability; aircraft equations of motion. Spacecraft orbital dynamics; two-body problem classical orbital elements; orbital maneuvers. (Taught at Illinois Institute of Technology as MMAE 441) (4.5 quarter hours)

IIT 342 | SPACECRAFT DYNAMICS | 4.5 quarter hours
(Undergraduate)
Orbital mechanics: two-body problem, Kepler's equation, classical orbital elements, and introduction to orbit perturbations. Spacecraft mission analysis: orbital maneuvers and station keeping, earth orbiting, lunar, and interplanetary missions, introduction to orbit determination. Spacecraft attitude dynamics: three-dimensional kinematics and dynamics of spacecraft, rotating reference frames and orientation angles, and spacecraft equations of motion. Spacecraft attitude stability and control: dual-spin platforms, momentum wheels, control-moment gyros, gravity gradient stabilization, introduction to spacecraft attitude determination and control. (Taught at Illinois Institute of Technology as MMAE 411) (4.5 quarter hours)

IIT 343 | SYSTEMS ANALYSIS AND CONTROL | 4.5 quarter hours
(Undergraduate)
Mathematical modeling of dynamic systems: linearization. Laplace transform; transfer functions; transient and steady-state response. Feedback control of single-input, single-output systems. Routh stability criterion. Root-locus method for control system design. Frequency-response methods; Bode plots; Nyquist stability criterion. (Taught at Illinois Institute of Technology as MMAE 443) (4.5 quarter hours)

IIT 344 | MICROCOMPUTERS | 6 quarter hours
(Undergraduate)
Microprocessors and stored program controllers. Memories. Standard and special interfaces. Hardware design. Software development. Interrupt systems. Hardware and software design tools. System design and troubleshooting. Emphasis on examples (Taught at IIT as ECE 441). (6 quarter hours)

IIT 345 | COMPUTER-AIDED DESIGN | 4.5 quarter hours
(Undergraduate)
Principles of geometric modeling, finite element analysis and design optimization. Curve, surface, and solid modeling. Mesh generation, Galerkin method, and Isoparametric elements. Optimum design concepts. Numerical methods for constrained and unconstrained optimization. Applications of CAD/CAE software for mechanical design problems. (Taught at Illinois Institute of Technology as MMAE 445.) (4.5 quarter hours)

IIT 346 | ADVANCED LOGIC DESIGN | 6 quarter hours
(Undergraduate)
Design and implementation of complex digital systems under practical design constraints. Timing and electrical considerations in combinational and sequential logic design. Digital system design using Algorithmic State Machine (ASM) diagrams. Design with modern logic families and programmable logic. Design-oriented laboratory stressing the use of programmable logic devices (Taught at IIT as ECE 446). (6 quarter hours)

IIT 349 | MECHANICAL LABORATORY I | 6 quarter hours
(Undergraduate)
Basic skills for engineering research are taught, which include: analog electronic circuit analysis; fundamentals of digital data acquisition; measurements of pressure, temperature, flow rate, heat transfer, and static forces and moments; and statistical date analysis. (Taught at Illinois Institute of Technology as MMAE 319.) (6 quarter hours)

IIT 350 | COMPUTATIONAL MECHANICS | 4.5 quarter hours
(Undergraduate)
Explores the use of numerical methods to solve engineering problems in solid mechanics, fluid mechanics and heat transfer. Topics include matrix algebra, nonlinear equations of one variable, systems of linear algebraic equations, nonlinear equations of several variables, classification of partial differential equations in engineering, the finite difference method, and the finite element method. (Taught at IIT as MMAE 350).

IIT 351 | SYSTEMS PROGRAMMING | 4.5 quarter hours
(Undergraduate)
Examines the components of sophisticated multilayer software systems, including device drivers, systems software, applications interfaces, and user interfaces. Explores the design and development of interrupt-driven and event-driven software. (Taught at Illinois Institute of Technology as CS 351.)

IIT 352 | AEROSPACE PROPULSION | 4.5 quarter hours
(Undergraduate)
Analysis and performance of various jet and rocket propulsive devices. Foundations of propulsion theory. Design and analysis of inlets, compressors, combustion chambers, and other elements of propulsive devices. Emphasis is placed on mobile power plants for aerospace applications. (Taught at Illinois Institute of Technology as MMAE 452) (4.5 quarter hours)

IIT 354 | AIRCRAFT DESIGN I | 4.5 quarter hours
(Undergraduate)
Aircraft design including aerodynamic, structural, and power plant characteristics to achieve performance goals. Focus on applications ranging from commercial to military and from manpowered to high-speed to long-duration aircraft. Semester project is a collaborative effort in which small design groups complete the preliminary design cycle of an aircraft to achieve specific design requirements. (Taught at IIT as MMAE 414).

IIT 355 | CARDIOVASCULAR FLUID MECHANICS | 4.5 quarter hours
(Undergraduate)
Anatomy of the cardiovascular system. Scaling principles. Lumped parameter, one-dimensional linear and nonlinear wave propagation, and three-dimensional modeling techniques applied to simulate blood flow in the cardiovascular system. Steady and pulsatile flow in rigid and elastic tubes. Form and function of blood, blood vessels, and the heart from an engineering perspective. Sensing, feedback, and control of the circulation. Possible project using custom software to run blood flow simulations (Taught at IIT as MMAE 455). (4.5 quarter hours)

IIT 356 | DIGITAL SIGNAL PROCESSING I WITH LABORATORY | 6 quarter hours
(Undergraduate)
Discrete-time system analysis, discrete convolution and correlation, Z-transforms. Realization and frequency response of discrete-time systems, properties of analog filters, IIR filter design, FIR filter design. Discrete Fourier Transforms. Applications of digital signal processing. (Taught at Illinois Institute of Technology as ECE 436.) (6 quarter hours)

IIT 359 | OBJECT-ORIENTED PROGRAMMING AND COMPUTER SIMULATION | 4.5 quarter hours
(Undergraduate)
The use of object-oriented programming to develop computer simulations of engineering problems. Programming with the C++ language in a UNIX environment. OOP concepts including classes, inheritance, and polymorphism. Programming with classes, inheritance, and polymorphism. Programming with class libraries. Event-driven simulation techniques in an object-oriented environment. Programming projects will include the development of a simulator for an engineering application. (Taught at Illinois Institute of Technology as ECE 449.) (4.5 quarter hours)

IIT 362 | SPACECRAFT DESIGN 1 | 4.5 quarter hours
(Undergraduate)
Launch vehicle design including a system engineering, pay- load mission definition, propulsion and staging, structural design, trajectory analysis and guidance, launch window considerations, navigation and attitude determination, booster re-entry, range safety, and reliability. Semester-long project is focused on the integration of multiple systems into a coherent launch vehicle design to achieve specific mission requirements. (Taught at Illinois Institute of Technology as MMAE 412.) (4.5 quarter hours)

IIT 363 | SPACECRAFT DESIGN II | 4.5 quarter hours
(Undergraduate)
Spacecraft systems design including real world mission analysis and orbit design, launch vehicle requirements, attitude determination and control, propulsion, structural design, power systems thermal management, and telecommunications. Semester-long project is focused on the integration of multiple systems into a coherent spacecraft design to achieve specific mission requirements. (Taught at Illinois Institute of Technology as MMAE 413.) (4.5 quarter hours)

IIT 364 | PROBABILITY AND STATISTICS FOR ELECTRICAL AND COMPUTER ENGINEERS | 4.5 quarter hours
(Undergraduate)
This course focuses on the introductory treatment of probability theory including: axioms of probability, discrete and continuous random variables, random vectors, marginal, joint, conditional and cumulative probability distributions, moment generating functions, expectations, and correlations. Also covered are sums of random variables, central limit theorem, sample means, and parameter estimation. Furthermore, random processes and random signals are covered. Examples and applications are drawn from problems of importance to electrical and computer engineers. (Taught at Illinois Institute of Technology as MATH 374.) (4.5 quarter hours)

IIT 365 | AEROSPACE LABORATORY I | 6 quarter hours
(Undergraduate)
Basic skills for engineering research are taught, which include: analog electronic circuit analysis, fundamentals of digital data acquisition, measurements of pressure, temperature, flow rate, heat transfer, and static forces and moments; statistical data analysis. (Taught at Illinois Institute of Technology as MMAE 315.) (6 quarter hours)

IIT 366 | AEROSPACE LABORATORY II | 6 quarter hours
(Undergraduate)
Advanced skills for engineering research are taught, which include experiments with digital electronic circuit analysis, dynamic data acquisition techniques, fundamentals of fluid power system design, GPS and inertial guidance systems, air-breathing propulsion, and fly-by-wire control. (Taught at Illinois Institute of Technology as MMAE 415.) (6 quarter hours)

IIT 369 | MECHANICAL LABORATORY II | 6 quarter hours
(Undergraduate)
Laboratory testing methods including solid mechanics: tension, torsion, hardness, impact, toughness, fatigue and creep; heat and mass transfer: conduction, fins, convection, radiation, diffusion; vibrations and control. Design of experiments. (Taught at Illinois Institute of Technology as MMAE 419.) (6 quarter hours)

IIT 371 | ENGINEERING MATERIALS AND DESIGN | 4.5 quarter hours
(Undergraduate)
Mechanical behavior of metals, polymers, ceramics and composites, laboratory testing methods including tension, torsion, hardness, impact, toughness, fatigue and creep. Evaluation of structural performance in terms of material processing, service conditions and design. (Taught at Illinois Institute of Technology as MMAE 371) (4.5 quarter hours)

IIT 372 | HEALTH PHYSICS | 4.5 quarter hours
(Undergraduate)
This course covers topics in Radiation Physics, including general aspects of radioactivity, radioactive series decay, alpha particle energies, beta decays, electron capture, gamma ray emission, interaction of radiation with matter, two-particle collisions, elastic scattering, interaction of heavy charged particles with matter, Coulomb force interactions, radiative stopping power, collision stopping power for heavy charged particles, interaction of light charged particles with matter, and bremsstrahlung radiation (Taught at IIT as PHYS 571) (4.5 quarter hours)

IIT 373 | HEALTH PHYSICS II | 4.5 quarter hours
(Undergraduate)
Continuation of the basic health physics sequence, including neutron production and interaction with matter; methods of radiation detection; radiation dosimetry; chemical and biological effects of radiation; radiation protection standards; shielding; dosimetric models; accelerator, reactor and medical health physics. (Taught at IIT as PHYS 572) (4.5 quarter hours)

IIT 374 | PROBABILITY AND STATISTICS | 4.5 quarter hours
(Undergraduate)
Elementary probability theory including discrete and continuous distributions, sampling, estimation, confidence intervals, hypothesis testing, and linear regression. Credit not granted for both MATH 474 and MATH 475. (Taught at Illinois Institute of Technology as MATH 474) (4.5 quarter hours)

IIT 375 | AEROSPACE MATERIALS LAB | 4.5 quarter hours
(Undergraduate)
Taught at IIT as MMAE 372. (4.5 quarter hours)

IIT 376 | DIGITAL & DATA COMMUNICATION SYSTEMS | 4.5-6 quarter hours
(Undergraduate)
Introduction to Amplitude, Phase, and Frequency modulation systems. Multiplexing and Multi-Access Schemes; Spectral design considerations. Sampling theorem. Channel capacity, entropy; Quantization, wave shaping, and Inter-Symbol Interference (ISI), Matched filters, Digital source encoding, Pulse Modulation systems. Design for spectral efficiency and interference control. Probability of error analysis, Analysis and design of digital modulators and detectors. (Taught at Illinois Institute of Technology as ECE 403, without lab, or ECE 405, with laboratory.)

IIT 378 | POWER SYSTEMS ANALYSIS | 4.5 quarter hours
(Undergraduate)
Transmission systems analysis and design. Large scale network analysis using Newton-Raphson load flow. Unsymmetrical short-circuit studies. Detailed consideration of the swing equation and the equal-area criterion for power system stability studies. (Taught at Illinois Institute of Technology as ECE 418.) (4.5 quarter hours)

IIT 379 | POWER SYSTEMS ANALYSIS WITH LABORATORY | 6 quarter hours
(Undergraduate)
Transmission systems analysis and design. Large scale network analysis using Newton-Raphson load flow. Unsymmetrical short-circuit studies. Detailed consideration of the swing equation and the equal-area criterion for power system stability studies. Use of commercial power system analysis tool to enhance understanding in the laboratory. (Taught at Illinois Institute of Technology as ECE 419.) (6 quarter hours)

IIT 380 | ANALYTICAL METHODS IN POWER SYSTEMS | 4.5 quarter hours
(Undergraduate)
Fundamentals of power systems operation and planning. Economic operation of power systems with consideration of transmission losses. Design of reliable power systems, power systems security analysis, optimal scheduling of power generation, estimation of power system state. (Taught at Illinois Institute of Technology as ECE 420.) (4.5 quarter hours)

IIT 385 | MANUFACTURING PROCESSES | 4.5 quarter hours
(Undergraduate)
Principles of material forming and removal processes and equipment. Force and power requirements, surface integrity, final properties and dimensional accuracy as influenced by material properties and process variables. Design for manufacturing. Factors influencing choice of manufacturing process. (Taught at Illinois Institute of Technology as MMAE 485.) (4.5 quarter hours)

IIT 386 | COMPUTER ORGANIZATION AND DESIGN | 4.5 quarter hours
(Undergraduate)
This course covers basic concepts and state-of-the-art developments in computer architecture: computer technology, performance measures, instruction set design, computer arithmetic, controller and datapath design, memory systems, pipelining, array processing, parallel processing, multiprocessing, abstract analysis models, input-output systems, relationship between computer design and application requirements, and cost/performance trade-offs. Students will complete a project implementing a version of multiple-cycle processor. Credit will be given for either ECE 485 or CS 470, but not both (Taught at IIT as ECE 485). (4.5 quarter hours)

IIT 387 | IIT ELECTIVE | 4.5-6 quarter hours
(Undergraduate)
Elective courses taken at IIT with permission of advisor. (variable credit)

IIT 391 | IIT CO-OP | 4-18 quarter hours
(Undergraduate)
The student will participate in on-site or off-site activity (including, but not limited to, production or research activity). The student will be responsible for, e.g., designing, testing and deploying hardware or software, and may be involved in production level issues. Typically, this position will be a coop at some institution designated by IIT. (variable credit)

IIT 397 | INTER-PROFESSIONAL PROJECT | 4.5 quarter hours
(Undergraduate)
Interprofessional projects allow students to learn teamwork, leadership and project management skills while working in multidisciplinary teams on projects involving technical, ethical, environmental, economic, public policy and legal issues. IPRO project teams are typically comprised of six to ten students from sophomore through graduate level and from all disciplines, who can broadly contribute to a project effort. While every effort will be made to accommodate students' first choices, it may be necessary to balance students across all projects scheduled for the semester or to consolidate students into fewer projects to meet minimum team requirements. Specific rules about selection of IPRP projects may apply in certain degree programs. Some projects may carry humanities or social sciences credit. Students must consult the lead faculty member for the project and their faculty adviser before registering for a project. (Taught at Illinois Institute of Technology as IPRO 497; formerly IPRO 397) (4.5 quarter hours)

IIT 398 | INTER-PROFESSIONAL PROJECT | 4.5 quarter hours
(Undergraduate)
Interprofessional projects allow students to learn teamwork, leadership and project management skills while working in multidisciplinary teams on projects involving technical, ethical, environmental, economic, public policy and legal issues. IPRO project teams are typically comprised of six to ten students from sophomore through graduate level and from all disciplines, who can broadly contribute to a project effort. While every effort will be made to accommodate students' first choices, it may be necessary to balance students across all projects scheduled for the semester or to consolidate students into fewer projects to meet minimum team requirements. Specific rules about selection of IPRP projects may apply in certain degree programs. Some projects may carry humanities or social sciences credit. Students must consult the lead faculty member for the project and their faculty adviser before registering for a project. (Taught at Illinois Institute of Technology as IPRO 497) (4.5 quarter hours)