Program & Technical Electives

ECE 212

- **Course Description:**
  Microcomputer architecture, assembly language programming, sub-routine handling, memory and input/output system and interrupt concepts. Credit may be obtained in only one of ECE 212, E E 380 or CMPUT 229.

- **Prerequisite:**
   ECE 210 or E E 280 or CMPUT 329

- **Terms the course is available in:**
  Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Edmond Lou (teaching in Winter Term 2024), Jeremy Sit (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  The professor does not have a rating on Rate My ProfessorJeremy Sit's Rate My Professor rating is 3.1/5

- **Course Difficulty:**
   The course ECE 212 is described as a challenging one, with several students expressing frustration over the incomplete notes and the need to attend classes to fully understand the material. Some students suggest using additional resources such as YouTube channels and the programming card to aid in learning the Coldfire assembly language. Others recommend recording lectures to ensure that important details are not missed. The final exams are reportedly difficult and require a deep understanding of the material. Overall, the consensus seems to be that the course is not an easy one and requires a significant time investment to master the concepts.

ECE 380

- **Course Description:**
  Basics of analog communication: amplitude, angle, and analog pulse modulation; modulators and demodulators; frequency multiplexing. Basics of digital communication: sampling, quantization, pulse code modulation, time division multiplexing, binary signal

formats. Credit may be obtained in only one of ECE 380 or E E 390.

- **Prerequisite:**
  ECE 240 or E E 238

- **Terms the course is available in:**
  Winter Term 2024, Fall Term 2024, Winter Term 2025

- **Instructor(s):**
  Xingyu Li (teaching in Winter Term 2024), Instructor(s) undecided for Fall Term 2024, Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  The professor does not have a rating on Rate My Professor

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 450

- **Course Description:**
  Semiconductor device physics, device scaling trends, advanced MOSFET fabrication and the associated quantum mechanical framework in nanoscale systems. Semiconductor devices as a system of elemental components. Quantum phenomena in the evaluation of semiconductor devices. Impact of new materials such as high-k gate dielectrics, copper damascene processing and diffusion barriers on device performance. Choice of channel materials and strain condition for ultrascaled logic devices, RF and power electronic devices. Credit may be obtained in only one of ECE 450 or E E 450.

- **Prerequisite:**
  ECE 302 or E E 340

- **Terms the course is available in:**
  Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Manisha Gupta (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  Manisha Gupta's Rate My Professor rating is 1.9/5

- **Course Difficulty:**
  Based on the provided context, it appears that someone has shared a link to an old syllabus for a Mechanical Engineering course at the University of Alberta. While the specific course mentioned is not ECE 450, it is possible to infer some information about the difficulty level of ECE 450 based on the general context.

  The fact that someone is sharing an old syllabus suggests that the current syllabus for ECE 450 may be different, and potentially more challenging. Additionally, the use of the term "old" implies that the syllabus may be outdated and therefore less effective in preparing students for the current demands of the course.

  However, it is important to note that the difficulty of a course can vary greatly from year to year, and even from semester to semester, depending on the specific instructors and teaching assistants. Therefore, while this context may provide some insight into the potential difficulty of ECE 450, it should not be taken as definitive evidence.

  Overall, based on the context provided, it seems reasonable to assume that ECE 450 may be a challenging course, particularly for students who are not well-prepared or who do not have a strong foundation in the relevant mathematical and engineering concepts. However, without more information, it is impossible to say for certain how difficult the course actually is.

ECE 452

- **Course Description:**
  Introduction to advanced numerical methods such as finite-difference, finite-element and spectral-domain techniques for solving partial differential equations. Simulations of nanoscale systems involving multiphysics or coupled differential equations involving electron and thermal transport phenomena, electrodynamics, MEMS, and process simulation, graphical methods for 3D visualization of simulation data. Examples from applied areas of nanoengineering to demonstrate computational methods for understanding complex physical phenomena and for designing and simulating nanoscale devices and systems. Credit may be obtained in only one of ECE 452 or E E 445.

- **Prerequisites:**
  ECE 341 or MATH 309 or 311

- **Terms the course is available in:**
  Fall Term 2024

- **Instructor(s):**
  Instructor(s) undecided for Fall Term 2024

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 456

- **Course Description:**
  Fundamental concepts related to current flow in nanoelectronic devices. Energy level diagram and the Fermi function. Single-energy-level model for current flow and associated effects, such as the quantum of conductance, Coulomb blockade, and single electron charging. The Schroedinger equation and quantum mechanics for applications in nanoelectronics. Matrix-equation approach for numerical band structure calculations of transistor channel materials. k-space, Brillouin zones, and density of states. Subbands for quantum wells, wires, dots, and carbon nanotubes. Current flow in nanowires and ballistic nanotransistors, including minimum possible channel resistance, quantum capacitance, and the transistor equivalent circuit under ballistic operation. Credit may be obtained in only one of ECE 456 or E E 456.

- **Prerequisite:**
  ECE 302 or E E 340

- **Terms the course is available in:**
  Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Mani Vaidyanathan (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  Mani Vaidyanathan's Rate My Professor rating is 5/5

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 457

- **Course Description:**
  Microfabrication processes for CMOS, bipolar, MEMS, and microfluidics devices.

Laboratory safety. Deposition processes of oxidation, evaporation and sputtering. Lithography, wet and dry etch, and device characterization. Note: Consent of Department required. Credit may be obtained in only one of ECE 457 or E E 457.

- **Prerequisites:**
  None

- **Terms the course is available in:**
  Fall Term 2024, Winter Term 2025

- **Instructor(s):**
  Instructor(s) undecided for Fall Term 2024, Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 472

- **Course Description:**
  Interaction of radiation with atoms, laser oscillations and threshold conditions, 3- and 4-level laser systems, rate equations, special properties of laser light, cavity Q and photon lifetime, optical resonators and lens waveguides, Gaussian beams, gain saturation, Q-switching, mode locking, interaction of light and sound, holography. Description of various lasers: solid, gas, semiconductor, dye, Raman and chemical. Laser applications. Credit may be obtained in only one of ECE 472 or E E 472.

- **Prerequisites:**
  ECE 370 or E E 315 or PHYS 381 or consent of Instructor

- **Terms the course is available in:**
  Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Jason Myatt (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  Jason Myatt's Rate My Professor rating is 4.3/5

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 475

- **Course Description:**
  Basic optical properties of crystalline and amorphous semiconductor materials: energy band diagrams, optical constants. Recombination and light emission in semiconductors. Light emitting diodes: spectral characteristics, materials, and applications. Stimulated emission and laser oscillation conditions in semiconductors. Laser diodes: modal and spectral properties, steady state rate equations, materials and structures. Light absorption, optical to electrical energy conversion. Photovoltaic cells: fill factors and efficiency, temperature effects, alternative materials and structures. Credit may be obtained in only one of ECE 475 or E E 475.

- **Prerequisite:**
  ECE 302 or E E 340

- **Terms the course is available in:**
  Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Amina Hussein (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  Amina Hussein's Rate My Professor rating is 4.5/5

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 476

- **Course Description:**
  Electrostatics and magnetostatics; Maxwell's equations and plane waves. Analysis and characterization of waveguides, rectangular and circular waveguides, waveguide cavities. Radiation mechanism of dipoles, fundamental parameters, Friis transmission

equations, link budget analysis, linear wire antennas, antenna arrays, different types of antennas, antenna measurements. Credit may be obtained in only one of ECE 476 or E E 476.

- **Prerequisites:**
  ECE 370 or E E 315 or PHYS 381

- **Terms the course is available in:**
  Fall Term 2024

- **Instructor(s):**
  Instructor(s) undecided for Fall Term 2024

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 478

- **Course Description:**
  Introduction to RF/microwave circuits and their applications. Maxwell's Equations and basic wave-propagation concepts. Transmission-line theory and impedance-matching techniques. Practical planar transmission lines. Lumped and distributed microwave-circuit elements. Microwave network analysis using impedance/admittance parameters, scattering parameters, and transmission-matrix methods. Analysis, design, fabrication, and test of practical RF/microwave devices including power dividers/combiners, couplers, amplifiers, and filters. Credit may be obtained in only one of ECE 478 or E E 478.

- **Prerequisites:**
  ECE 370 or E E 315 or PHYS 381

- **Terms the course is available in:**
  Fall Term 2024

- **Instructor(s):**
  Instructor(s) undecided for Fall Term 2024

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  478, also known as Microwaves, is considered the most challenging undergraduate EE course at the university. Despite its difficulty, students who have taken it often find it to be a rewarding experience. The course is well-organized and fair, providing students with all the necessary resources to fully understand the material.

BME 513

- **Course Description:**
  Introduction to basic physical and technological aspects of medical imaging. Emphasis on computed transmission and emission tomography, magnetic resonance, and ultrasound imaging. These methods are developed and contrasted in terms of how imaging information is generated, detected, and processed and how different hardware configurations and other factors limit image quality. Relative diagnostic potential of the imaging methods is also discussed in relation to future prospects of each method.

- **Prerequisites:**
  None

- **Terms the course is available in:**
  Winter Term 2024

- **Instructor(s):**
  Alan Wilman (teaching in Winter Term 2024), Robert Stobbe (teaching in Winter Term 2024)

- **Instructor ratings:**
  The professor does not have a rating on Rate My ProfessorThe professor does not have a rating on Rate My Professor

- **Course Difficulty:**
  Insufficient information available on course difficulty

BME 564

- **Course Description:**
  Designed for graduate and advanced undergraduate students requiring a thorough

grounding in the fundamentals of imaging by means of nuclear magnetic resonance, NMR. Topics include the principles of NMR as applied to imaging, image processing, imaging techniques for achieving specific types of contrast, image artefacts, and typical applications.

- **Prerequisite:**
  Consent of instructor

- **Terms the course is available in:**
  No term decided yet/not offered this year

- **Instructor(s):**
  No instructor teaching the course

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 304

- **Course Description:**
  MOS digital circuits, logic gates, threshold voltages. MOS logic families: design and simulation. CMOS timing: propagation delay, rise and fall times. Storage elements, memory, I/O and interfacing. Credit may be obtained in only one of ECE 304 or E E 351.

- **Prerequisites:**
  ECE 210 or E E 280 or CMPUT 329, and ECE 302 or E E 340

- **Terms the course is available in:**
  Fall Term 2024

- **Instructor(s):**
  Instructor(s) undecided for Fall Term 2024

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  304 is a challenging course in the Electrical and Computer Engineering department, which is restricted to Computer Engineering students until mid-June.

ECE 330

- **Course Description:**
Overview of power concepts, network equations, three-phase circuits, transformer and its characteristics, per-unit calculation, transmission lines and their basic operational characteristics, introduction to power system operation. Credit may be obtained in only one of ECE 330 or E E 330.

- **Prerequisite:**
 ECE 203 or E E 250

- **Terms the course is available in:**
Fall Term 2024

- **Instructor(s):**
Instructor(s) undecided for Fall Term 2024

- **Instructor ratings:**
No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
Insufficient information available on course difficulty

ECE 332

- **Course Description:**
Principles of electromagnetic force and torque in rotating machinery. Simple AC and DC machines. Induction motor theory. Practical aspects of induction motor use: characteristics, standards, starting, variable speed operation. Synchronous machine theory and characteristics. Fractional HP motor theory. Safety in electrical environments. Credit may be obtained in only one of ECE 332 or E E 332.

- **Prerequisite:**
 ECE 330 or E E 330 or consent of Department

- **Terms the course is available in:**
Winter Term 2024, Fall Term 2024, Winter Term 2025

- **Instructor(s):**
Ali Khajehoddin (teaching in Winter Term 2024), Instructor(s) undecided for Fall Term

2024, Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  Ali Khajehoddin's Rate My Professor rating is 4.7/5

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 401

- **Course Description:**
  Introduction to power electronics. AC-DC conversion. DC-AC conversion. DC-DC conversion. AC-AC conversion. Credit may be obtained in only one of ECE 401 or E E 431.

- **Prerequisite:**
   ECE 302 or E E 340

- **Terms the course is available in:**
  Fall Term 2024

- **Instructor(s):**
  Instructor(s) undecided for Fall Term 2024

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 402

- **Course Description:**
  Introduction to radio communications systems. Frequency selective circuits and transformers. Parallel resonant circuits including transformers. Double-tuned circuits. Impedance matching. Oscillators. Conditions for oscillation. Amplitude limitation mechanisms. Phase stability. Crystal oscillators. Mixers. Diode-ring mixers. Square-law mixers. BJT mixers. Intermodulation distortion. Modulators and demodulators. Average envelope detectors. FM demodulators. High frequency amplifiers and automatic gain control. Broadband techniques. Neutralization. Phase-lock loops. Phase detectors.

Voltage-controlled oscillators. Loop filters. Phase-locked loop applications. Power amplifiers. Corequisite: ECE 360 or ECE 362 or E E 357 or E E 462. Credit may be obtained in only one of ECE 402 or E E 451.

- **Prerequisite:**
  ECE 303 or E E 350

- **Terms the course is available in:**
  No term decided yet/not offered this year

- **Instructor(s):**
  No instructor teaching the course

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 403

- **Course Description:**
  Very Large Scale Integration (VLSI) design techniques and their application. Electrical characteristics of MOSFET devices and CMOS circuits. Use of CAD tools for simulation and integrated circuit layout. Modeling delays, advanced digital logic circuit techniques, memory. Credit may be obtained in only one of ECE 403 or E E 453.

- **Prerequisite:**
  ECE 304 or E E 351; corequisite: ECE 410 or CMPE 480

- **Terms the course is available in:**
  Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Duncan Elliott (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  Duncan Elliott's Rate My Professor rating is 2.4/5

- **Course Difficulty:**
  ECE 403 appears to be of varying difficulty based on the comments. While some find

442, a multimedia signal processing course, to be the easiest, others find it to be the most fun and interesting due to its focus on machine learning. The exact difficulty of ECE 403 is unclear without further context.

ECE 405

- **Course Description:**
  Introduction to the principles of biophysical instrumentation. Various sensors are examined including strain gauges, inductive, capacitive, thermal, and piezoelectric sensors. Methods of measuring blood pressure are discussed. Origin of biopotentials; membrane and action potentials. Measurement of bioelectrical signals such as the ECG and EMG. Electrical safety, noise, impedance matching, and analog-to-digital conversion. Applications of electrodes, biochemical sensors, and lasers. Credit may be obtained in only one of ECE 405 or EE BE 512.

- **Prerequisite:**
  ECE 203 or E E 250 or consent of the Instructor

- **Terms the course is available in:**
  Fall Term 2024

- **Instructor(s):**
  Instructor(s) undecided for Fall Term 2024

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  ECE 405, Biophysical Instrumentation and Measurement, is a course that has very few students enrolled, with an average of 50 students per semester for over a dozen years. The course is known to have a lot of calculations and theoretical questions on assignments and exams, but is considered to be fairly straightforward. The midterm exams are known to be time-consuming, and the course was previously taught by Zemp.

ECE 410

- **Course Description:**
  Review of classical logic design methods. Introduction to the hardware description language VHDL. Logic simulation principles. Digital system design. Digital system testing and design for testability. Arithmetic circuits. State-of-the-art computer-aided design tools and FPGAs are used to design and implement logic circuits. Corequisite: ECE 304

or E E 351. Credit may be obtained in only one of CMPE 480 or ECE 410.

- **Prerequisites:**
  None

- **Terms the course is available in:**
  Fall Term 2024

- **Instructor(s):**
  Instructor(s) undecided for Fall Term 2024

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  The course ECE 410 is challenging, with particularly difficult quizzes that include negative marking.

ECE 432

- **Course Description:**
  Introduction to variable speed drives. Frequency, phase and vector control of induction motors. Dynamic models for induction motors. Permanent magnet synchronous and brushless dc motor drives. Credit may be obtained in only one of ECE 432 or E E 432.

- **Prerequisite:**
  ECE 332 or E E 332

- **Terms the course is available in:**
  Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Hao Liang (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  Hao Liang's Rate My Professor rating is 4.9/5

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 440

- **Course Description:**
Extension of sampling theory and the Fourier transform to two dimensions, pixel operations including gray-level modification, algebraic and geometric transformations. The design of spatial filters for noise reduction, image sharpening and edge enhancement, and some discussion of interpolation techniques. An introduction to the concepts of image restoration from known degradations and the reconstruction of images from parallel and fan projections. Credit may be obtained in only one of EE BE 540 or ECE 440.

- **Prerequisite:**
ECE 340 or E E 338 or consent of Instructor

- **Terms the course is available in:**
Fall Term 2024

- **Instructor(s):**
Instructor(s) undecided for Fall Term 2024

- **Instructor ratings:**
No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
Insufficient information available on course difficulty

ECE 447

- **Course Description:**
The course introduces basic concepts and techniques of data analysis and machine learning. Topics include: data preprocessing techniques, decision trees, nearest neighbor algorithms, linear and logistic regressions, clustering, dimensionality reduction, model evaluation, deployment methods, and emerging topics.

- **Prerequisites:**
ECE 220 or CMPUT 275, and ECE 342 or STAT 235, or consent of instructor

- **Terms the course is available in:**
Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Marek Reformat (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  Marek Reformat's Rate My Professor rating is 4.7/5

- **Course Difficulty:**
  The course ECE 447 is a new introduction to machine learning, and while it is disorganized, the professor is great and the assessments are considered easy. The programming aspect is not too challenging for those with a background in software. Overall, the course is relatively easy.

ECE 450

- **Course Description:**
  Semiconductor device physics, device scaling trends, advanced MOSFET fabrication and the associated quantum mechanical framework in nanoscale systems. Semiconductor devices as a system of elemental components. Quantum phenomena in the evaluation of semiconductor devices. Impact of new materials such as high-k gate dielectrics, copper damascene processing and diffusion barriers on device performance. Choice of channel materials and strain condition for ultrascaled logic devices, RF and power electronic devices. Credit may be obtained in only one of ECE 450 or E E 450.

- **Prerequisite:**
  ECE 302 or E E 340

- **Terms the course is available in:**
  Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Manisha Gupta (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  Manisha Gupta's Rate My Professor rating is 1.9/5

- **Course Difficulty:**
  Based on the provided context, it appears that someone has shared a link to an old syllabus for a Mechanical Engineering course at the University of Alberta. While the specific course mentioned is not ECE 450, it is possible to infer some information about the difficulty level of that course based on the syllabus of a related engineering course.

The syllabus indicates that the course covers topics such as thermodynamics, fluid mechanics, and heat transfer. These topics are commonly found in engineering courses and are known to be challenging. Additionally, the syllabus mentions that the course includes laboratory components, which can add an extra layer of complexity and time commitment.

Based on this information, it is reasonable to assume that ECE 450, or any other engineering course at the University of Alberta, would also be challenging due to the nature of the material covered and the potential inclusion of laboratory components.

ECE 455

- **Course Description:**
Microfluidic and nanobiotechnological devices. Fabrication techniques for devices: self-assembly, lithographic technologies. Applications of nanobiotechnology in computing, electronics, human health, environment and manufacture. Credit may be obtained in only one of ECE 455 or E E 455.

- **Prerequisites:**
 MATH 201 or PHYS 230

- **Terms the course is available in:**
Winter Term 2024, Winter Term 2025

- **Instructor(s):**
Xihua Wang (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
Xihua Wang's Rate My Professor rating is 4.5/5

- **Course Difficulty:**
 Based on the comments, ECE 455 appears to be a challenging course, with some students expressing that it is an "absolute ass" and that they were forced to take it due to graduation requirements. In contrast, another student mentioned that they found 442 to be the most enjoyable and interesting elective, suggesting that it may be less difficult than ECE 455. The comment about 442 being the easiest course on the list seems to contradict this, but without further context it is unclear if this is accurate. Overall, it seems that ECE 455 may present a significant challenge for students.

ECE 458

- **Course Description:**
  Overview of microelectromechanical (MEMS) systems, applications of MEMS technology to radio frequency, optical and biomedical devices. Basic MEMS building blocks, cantilever and clamped-clamped beams. Actuation mechanisms of mechanical microdevices, thermal and electrostatic. The thin film fabrication process, deposition, lithography, etching and release. MEMS in circuits, switches, capacitors, and resonators. Credit may be obtained in only one of ECE 458 or E E 458.

- **Prerequisites:**
  ECE 370 or E E 315 or PHYS 381, and one of MAT E 201, PHYS 244, MEC E 250

- **Terms the course is available in:**
  Fall Term 2024

- **Instructor(s):**
  Instructor(s) undecided for Fall Term 2024

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 460

- **Course Description:**
  Introduction to computer control, sample and hold, discrete-time systems. States and state space models. Linearization of nonlinear state-space models. Solving linear time-invariant state-space equations. Discretization of continuous-time systems. Controllability and observability, and their algebraic tests. Minimal state-space realizations. State feedback and eigenvalue/pole assignment, deadbeat control. Step tracking control design. State estimation and observer design. Observer based control. Introduction to linear quadratic optimal control. Credit may be obtained in only one of ECE 460 or E E 460.

- **Prerequisites:**
  ECE 360 or E E 357, and ECE 340

- **Terms the course is available in:**
  Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Qing Zhao (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  Qing Zhao's Rate My Professor rating is 3.8/5

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 464

- **Course Description:**
  Basic concepts of computer-integrated intervention. Surgical CAD/CAM, assist and simulation systems. Actuators and imagers. Medical robot design, control and optimization. Surgeon-robot interface technology. Haptic feedback in surgical simulation and teleoperation. Virtual fixtures. Time delay compensation in telesurgery. Cooperative manipulation control. Overview of existing systems for robot-assisted intervention and for virtual-reality surgical simulation. Credit may be obtained in only one of ECE 464 or E E 464.

- **Prerequisite:**
  ECE 360 or ECE 462 or E E 357 or E E 462 or consent of the Department

- **Terms the course is available in:**
  Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Mahdi Tavakoli Afshari (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  The professor does not have a rating on Rate My Professor

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 474

- **Course Description:**
  Definition of plasma. Behavior in electric and magnetic fields. Particle, kinetic and fluid description of flow and transport phenomena. Waves in plasmas. Current approaches to thermonuclear fusion. High temperature laser produced plasmas and low temperature DC and RF discharge plasmas. Applications in discharge pumping of lasers, plasma etching, thin film deposition and generation of x-rays. Credit may be obtained in only one of ECE 474 or E E 474.

- **Prerequisites:**
  ECE 370 or E E 315 or PHYS 381

- **Terms the course is available in:**
  Fall Term 2024

- **Instructor(s):**
  Instructor(s) undecided for Fall Term 2024

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  Insufficient information available on course difficulty

ECE 485

- **Course Description:**
  Principles of digital communications; signal space concepts, digital modulation and demodulation, intersymbol interference, and pulse shaping. Design of optimal receivers; performance in the presence of channel noise. Introduction to source coding and channel coding. Credit may be obtained in only one of ECE 485 or E E 485.

- **Prerequisites:**
  ECE 342 or E E 387, and ECE 380 or E E 390

- **Terms the course is available in:**
  Fall Term 2024

- **Instructor(s):**
  Instructor(s) undecided for Fall Term 2024

- **Instructor ratings:**
  No professors teaching this term, so no ratings available at all

- **Course Difficulty:**
  The comments suggest that the lab component of ECE 485 may not require students to bring their own lab kits, as the necessary equipment is provided in the lab room. However, students may still need to bring or acquire certain components for their projects during the capstone phase. The overall difficulty of the course is not explicitly stated in the comments, but it can be inferred that it involves a significant lab component.

ECE 486

- **Course Description:**
  Characteristics of wireless channels; path loss, shadow fading and multipath propagation. Challenges in wireless system design, digital modulation techniques for wireless communications, transmitter and receiver design for fading channels. Fundamentals of cellular system design and multiple access techniques. Credit may be obtained in only one of ECE 486 or E E 486.

- **Prerequisites:**
  ECE 342 or E E 387, and ECE 380 or E E 390

- **Terms the course is available in:**
  Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Yindi Jing (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  Yindi Jing's Rate My Professor rating is 3.6/5

- **Course Difficulty:**
  Insufficient information available on course difficulty

PHYS 397

- **Course Description:**
  Projects from core physics topics including classical and quantum optics, particle physics, solid state physics and surface science. Students master the fundamental skills for work in research labs and related settings through design and execution of experimental projects. Corequisite MATH 337 or ECE 341 or equivalent.

- **Prerequisite:**
  PHYS 292 or 297, and PHYS 381

- **Terms the course is available in:**
  Winter Term 2024, Winter Term 2025

- **Instructor(s):**
  Marie-Cécile Piro (teaching in Winter Term 2024), Mark Freeman (teaching in Winter Term 2024), Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  The professor does not have a rating on Rate My ProfessorMark Freeman's Rate My Professor rating is 2.9/5

- **Course Difficulty:**
  Insufficient information available on course difficulty