Group 2 Electives

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):**
  Robert Stobbe (teaching in Winter Term 2024), Alan Wilman (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, with enrollment 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 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 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, which is not mentioned in the context, is likely to be more difficult than both 442 courses mentioned, as one comment describes it as the most fun and interesting elective, while the other comment states that it is the easiest on the list. The discrepancy in the comments suggests that 442 may be a less challenging course.
  However, it is important to note that the difficulty of a course can vary greatly depending on individual strengths and weaknesses, and these comments do not necessarily reflect the experience of every student who has taken the courses.

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 in it, with an average of 50 students per semester for the past dozen years. The course is known to have a significant amount of calculations and theoretical questions on assignments and exams, but is considered to be fairly straightforward. The midterm exams in this course have been known to be time-consuming.

ECE 408

- **Course Description:**
  Intended to enable individuals or a small group of students to study topics in their particular field of interest under the supervision of a member of the Department of Electrical and Computer Engineering or other appropriate departments.

- **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 408 appears to be a research-oriented course, where students with a shared interest in a topic can propose a project and, if approved, work on it under the supervision of a professor. The specifics of grading and availability of the course are unclear. The difficulty of the course would likely depend on the complexity of the research project and the level of guidance provided by the supervising professor.

ECE 409

- **Course Description:**
  Intended to enable individuals or a small group of students to study topics in their particular field of interest under the supervision of a member of the Department of Electrical and Computer Engineering or other appropriate departments.

- **Prerequisites:**
  None

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

- **Instructor(s):**
  Instructor(s) undecided for Winter 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 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 feature negative marking.

ECE 430

- **Course Description:**
  Transmission line design parameters; power flow computations; Generator control systems, load frequency control; economic operation of power systems; Symmetrical components theory; Symmetrical and unsymmetrical fault analysis. Corequisite: ECE 332 or E E 332. Credit may be obtained in only one of ECE 430 or E E 430.

- **Prerequisite:**
  ECE 330 or E E 330

- **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 430 appears to be challenging, as indicated by the fact that the final average was 78% and a 95%+ was required for an A+. Additionally, there were only 15 students in the class, suggesting that the grading may have been competitive and curved. The comment "oof" suggests disappointment or frustration, possibly due to the perceived difficulty of the course.

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 reportedly great and the assessments are considered easy. The programming aspect is not overly challenging for those with a background in software. Overall, the course is relatively easy.

ECE 449

- **Course Description:**
  Intelligent systems for automatic control and data analysis. The concepts of vagueness and uncertainty, approximate reasoning, fuzzy rule-based systems and fuzzy control. Strategies for learning and adaptation, supervised and reinforcement learning, self-organization and the selection of neural network architectures. Discussion of the principles of search and optimization, evolution and natural selection and genetic algorithms. Introduction to hybrid intelligence. Applications of intelligent systems for pattern recognition, classification, forecasting, decision support, and control. Credit may be obtained in only one of CMPE 449 or ECE 449.

- **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 comments suggest that ECE 449 is primarily a programming course, and that lab equipment may not be necessary. However, some components might be required for capstone projects. The overall difficulty of the course is not explicitly stated, but it can be inferred that it is more focused on programming than lab work.

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 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 is considered to be a challenging course by some students, as there are reports of it being an "absolute ass" and requiring a significant amount of effort to pass. However, it may be necessary for graduation, and students may be advised to enroll in it. The course is not explicitly mentioned in the comments, but it is implied that it is a more difficult option compared to other electives such as 442, which is described as "the easiest on this list" and "most fun and interesting." Therefore, ECE 455 appears to be a more difficult course compared to other options.

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 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 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 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

rewarding. The course is well-organized and fair, providing students with all the necessary resources to understand the material.

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