Group 2 Electives

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 due to its advanced nature. Enrollment is limited to Computer Engineering students until mid-June.

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 442

- **Course Description:**
  Human visual/audio perception and multimedia data representations. Basic multimedia processing concepts, multimedia compression and communications. Machine learning tools for multimedia signal processing, including principle component analysis and Gaussian mixture modeling. Applications to human-computer interaction, visual-audio, and visual-text processing. Credit may be obtained in only one of ECE 442 or E E 442.

- **Prerequisites:**
  ECE 220 or CMPUT 275, ECE 342, MATH 102 or equivalent knowledge

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

- **Instructor(s):**
  Li Cheng (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:**
  442 can be considered to have varying levels of difficulty depending on the specific focus within the field of machine learning. While some may find it to be the most fun and interesting elective due to its in-depth exploration of the subject, others may perceive it as the easiest elective on the list due to its focus on multimedia signal processing.

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 in the post is not ECE 450, it is possible to infer some information about the difficulty of ECE 450 based on the context.

  The syllabus includes a list of topics that are typically covered in a Mechanical Engineering course, such as thermodynamics, mechanics of materials, and control systems. However, it is important to note that the difficulty of ECE 450 may vary depending on the specific instructor and teaching style, as well as the prerequisite knowledge and skills of the students.

  Without more information, it is difficult to make a definitive statement about the difficulty of ECE 450. However, based on the context of the post, it is likely that ECE 450 is a challenging course, as it is often the case that Mechanical Engineering courses require a strong foundation in mathematics and physics, as well as a good understanding of engineering principles and design. Additionally, the fact that someone is sharing an old syllabus suggests that they may be preparing for the course or seeking

to understand its requirements, indicating that they expect it to be a significant challenge.

Overall, based on the context provided, it is reasonable to assume that ECE 450 is a challenging course, but the exact level of difficulty may vary depending on individual circumstances.

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 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 471

- **Course Description:**
  Electromagnetic wave propagation at optical frequencies and approximations. Thermal and luminescent light sources, optical beams. Ray and Gaussian optics and simple optical components. Wave optics, polarization, interference, interferometric devices. Light-matter interactions. Optics of crystals; polarizers and waveplates. Photodetectors. Photonic engineering applications. Corequisite: ECE 370 or E E 315, or PHYS 381. Note: Only one of the following courses may be taken for credit: ECE 471, E E 471 or PHYS 362.

- **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:**
  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

BIOCH 200

- **Course Description:**
  An introduction to the fundamental principles of biochemistry. Protein structure and function; enzymes; lipids and the structure of biological membranes; nucleotides and the structure of nucleic acids; bioenergetics and the catabolism of carbohydrates.

- **Prerequisites:**
  CHEM 101 and CHEM 261 or 164, or SCI 100

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

- **Instructor(s):**
  Jonathan Parrish (teaching in Winter Term 2024), Adrienne Wright (teaching in Winter Term 2024), Adrienne Wright (teaching in Spring Term 2024), Jonathan Parrish (teaching in Fall Term 2024), Adrienne Wright (teaching in Fall Term 2024), Jonathan Parrish (teaching in Winter Term 2025), Adrienne Wright (teaching in Winter Term 2025)

- **Instructor ratings:**
  Jonathan Parrish's Rate My Professor rating is 5/5, Adrienne Wright's Rate My Professor rating is 5/5, Adrienne Wright's Rate My Professor rating is 5/5, Jonathan Parrish's Rate My Professor rating is 5/5, Adrienne Wright's Rate My Professor rating is 5/5, Jonathan Parrish's Rate My Professor rating is 5/5, Adrienne Wright's Rate My Professor rating is 5/5

- **Course Difficulty:**
  The course BIOCH 200 is considered to be moderately difficult, with a significant emphasis on memorization of amino acids and nucleotides. The midterm exams are known to be challenging and specific, and students recommend starting early and reviewing frequently to ensure a good understanding of the material. The final exam is worth a larger percentage of the grade, but the midterm still carries significant weight. Some students suggest that memorizing the amino acids and their charges at certain pH levels is crucial for success in the course. Additionally, some students have reported that old exams can be helpful for preparation, but obtaining them can be difficult. The course is worth 40% midterm, 55% final, and 5% participation. The average midterm score is around 60, but the final grade can vary widely depending on individual performance.

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

CHEM 261

- **Course Description:**
  The correlation of structure and chemical bonding in carbon compounds with the physical properties and chemical reactivity of organic molecules. Discussion will be based on functional groups with emphasis on hydrocarbons and derivatives that contain halogens, oxygen, sulfur, and the hydroxy group. Introduction to stereochemistry, three dimensional structure, reaction mechanisms, especially addition to double bonds, nucleophilic substitution and elimination reactions. Note: Students who have obtained credit for CHEM 264 cannot take CHEM 261 for credit. Engineering students who take this course will receive *4.5.

- **Prerequisite:**
  Prerequisite CHEM 101 or 103

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

- **Instructor(s):**
  Michael Meanwell (teaching in Winter Term 2024), DLJ Clive (teaching in Winter Term 2024), Matthew Macauley (teaching in Winter Term 2024), Hashem Taha (teaching in Spring 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 ProfessorThe professor does not have a rating on Rate My ProfessorMatthew Macauley's Rate My Professor rating is 3.8/5, Hashem Taha's Rate My Professor rating is 3.6/5

- **Course Difficulty:**
  The comments suggest that the course CHEM 261 can vary in difficulty depending on the individual, but overall it is not as difficult as some people make it out to be. To do well in the course, students should dedicate time to studying the material, doing practice problems, and reviewing after class. Some students also recommend using specific textbooks or resources, such as David Klein's Organic Chemistry as a Second Language or the Organic Chemistry Tutor on YouTube. The lab component of the course is also important and can provide valuable experience, but it may require memorization for the lab final. Overall, the key to success in CHEM 261 is to stay on top of the material, understand the concepts, and put in the necessary practice.

CHEM 263

- **Course Description:**
  Continuation of the structural and chemical properties of the basic functional groups of organic compounds including alkynes, aromatic compounds, aldehydes, ketones, carboxylic acids and their derivatives and amines. Illustration of these functional groups in natural products such as carbohydrates, amino acids and proteins, nucleic acids and lipids. Discussion of the application of spectroscopic methods for the structure determination in simple organic molecules. Students who have obtained credit for CHEM 265 cannot take CHEM 263 for credit.

- **Prerequisites:**
  CHEM 261 or CHEM 264 and 266 or SCI 100

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

- **Instructor(s):**
  Tina Grant (teaching in Winter Term 2024), Tina Grant (teaching in Spring Term 2024), Instructor(s) undecided for Fall Term 2024, Instructor(s) undecided for Winter Term 2025

- **Instructor ratings:**
  Tina Grant's Rate My Professor rating is 5/5, Tina Grant's Rate My Professor rating is 5/5

- **Course Difficulty:**
  The course CHEM 263 is considered to be more difficult than CHEM 261 due to the increased complexity of the reactions that need to be memorized. Students suggest dedicating time to learning the reactions and their mechanisms, as well as utilizing resources such as flashcards, textbooks, and videos to aid in memorization. The lab component of the course is also reported to be more time-consuming and application-based compared to the theory-based labs in CHEM 261. Overall, the course is seen as requiring a significant amount of memorization and practice to master the material.

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 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 seems to have a significant curve, as indicated by the final average being below 80% but some students receiving A+ grades. The commenter seems to have finished with a high grade, suggesting that the course may be challenging but not impossible to excel in. However, the presence of the comment "oof" suggests that some students may have struggled more than others. Overall, the course appears to be difficult but with the potential for high rewards for those who put in the effort.

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:**
  The students are discussing a missing deadline for a project in the course ECE 456. They are unsure if the deadline was mentioned in the syllabus or not. One student claims that the professor mentioned the deadline as March 11, in the evening, but this was not stated in the syllabus. The students are undergraduates in the Faculty of Engineering. Based on this context, it appears that ECE 456 is a course with some level of ambiguity and potential for miscommunication, as important deadlines may not always be clearly stated in the syllabus. The students seem to be experiencing some confusion and uncertainty regarding the project deadline.

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 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 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 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.