Group 2 Electives

CMPUT 250

- **Course Description:**
  An interdisciplinary course for students in Science, Arts, and other faculties. The focus is on games as interactive entertainment, their role in society, and how they are made. Teams composed of students with diverse backgrounds (e.g. English, Art and Design, and Computing Science) follow the entire creative process: from concept, through pitch, to delivery, of a short narrative-based game using a commercial game engine. To achieve the required mix of backgrounds and experience, students must apply to be considered for this course. See the Department web site for the online form.

- **Prerequisite:**
  Second-year standing

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

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

- **Instructor ratings:**
  Matthew Guzdial's Rate My Professor rating is 5.1/5

- **Course Difficulty:**

  CMPUT 250 is a difficult course, but if you are passionate about it, you will enjoy it. The course requires a lot of work, and you should expect to spend a significant amount of time on it. The course includes midterms, finals, labs, and a group project. The tests and labs are reportedly easy if you pay attention in class, but the group project can be challenging depending on the dynamics of your group. The grade average is typically high, so if you put in the work, you are likely to receive a good grade. Admission to the course may be competitive, and you may need to be placed on a waiting list. As a music student, you may find that the amount of music you need to create depends on the game your team chooses to make, but you can use online sources for royalty-free sounds. Programming skills are not essential for the music role, but they can be helpful for creating more specialized sounds.

CMPUT 304

- **Course Description:**
  The second course of a two-course sequence on algorithm design. Emphasis on principles of algorithm design. Categories of algorithms such as divide-and-conquer, greedy algorithms, dynamic programming; analysis of algorithms; limits of algorithm design; NP-completeness; heuristic algorithms.

- **Prerequisites:**
  CMPUT 204; one of STAT 151, 161, 181, 235, 265, SCI 151, or MATH 181; and one of MATH 225, 227, or 228

- **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 CMPUT 304 is not difficult, but the professor teaching it is not good at teaching. The professor, Hayward, is not passionate about teaching and has a poor teaching style that does not match how most students learn. The professor often introduces a concept and then reads some GitHub code that no one understands, leaving everyone confused. The professor is also very lazy and ends class early every time. However, the course itself is super low maintenance. The homework is what you need to focus on, as the quizzes and final are very similar to the homework. The course is not hard, but it will require self-teaching and using outside resources such as YouTube and StackOverflow to learn the material. If you have taken CMPUT 204, it will be helpful for this course. Overall, the course is not difficult, but the professor makes it harder than it needs to be.

CMPUT 307

- **Course Description:**
  An introductory course on the theory and applications of computer based 3D modeling and animation. The course will cover a selection of topics from overview of tools supporting modeling and animation, automatically generating 3D models, and animation of skeleton based models through algorithms and software. Applications of 3D modeling and animation in games, virtual/augmented environments, movies, and emerging video transmission algorithms will be discussed.

- **Prerequisites:**
  one of CMPUT 206, 308, or 411; or consent of the instructor

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

- **Instructor(s):**
  Anup Basu (teaching in Winter Term 2024),

- **Instructor ratings:**
  Anup Basu's Rate My Professor rating is 4.3/5

- **Course Difficulty:**

  The difficulty of CMPUT 307 is not explicitly stated in the comments, but it is mentioned that having a good 3D math knowledge and taking CMPUT 340 and 411 beforehand can help. It is also mentioned that one of the prerequisites is CMPUT 206, and that it might be possible to waive this prerequisite, but it is not clear how difficult this would be. It is not explicitly stated whether or not it is possible to take CMPUT 307 without CMPUT 206, but one person is trying to do this. They do not mention whether or not they have been successful. Overall, it is unclear how difficult CMPUT 307 is without the prerequisites, but it is mentioned that having a good 3D math knowledge and taking CMPUT 340 and 411 beforehand can help.

CMPUT 325

- **Course Description:**
  A study of the theory, run-time structure, and implementation of selected non-procedural programming languages. Languages will be selected from the domains of functional, and logic-based languages.

- **Prerequisites:**
  CMPUT 201 and 204 or 275; one of CMPUT 229, E E 380 or ECE 212, and MATH 125

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

- **Instructor(s):**
  Jia-Huai You (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:**
  The midterm is similar to the assignment, which suggests that the course is not very difficult.

CMPUT 350

- **Course Description:**
  This course focuses on state-of-the-art AI and graphics programming for video games. Part 1 introduces C++, the language of choice for video game engines, emphasizing efficiency, safety, the Standard Template Library, and OpenGL. Part 2 on real time strategy deals with efficient pathfinding algorithms, planning, and scripting AI systems. Student projects give hands-on experience directly applicable to the video games industry.

- **Prerequisites:**
  CMPUT 201 or 275, and 204

- **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:**

  CMPUT 350 is a difficult course. The course requires a lot of work and practice, and it is important to stay on top of the material. The assignments and labs can be challenging and time-consuming, and it is important to be prepared for them. The course also includes a group project, which can be difficult if group members are not willing to work. However, with dedication and hard work, it is possible to succeed in the course. It is also important to note that the course can be overwhelming at times, but it is important to keep perspective and not get discouraged. Overall, CMPUT 350 is a challenging course, but with the right mindset and preparation, it is possible to do well.

CMPUT 366

- **Course Description:**
  This course provides an introduction to search and planning in artificial intelligence. The course covers deterministic single-agent and multi-agent problems. Students will learn how to model real-world problems as state-space search problems and how to solve such problems. The course covers algorithms for solving deterministic shortest path problems with factored and non-factored states, combinatorial optimization problems, constraint satisfaction problems, and multi- agent problems.

- **Prerequisites:**
  CMPUT 204 or 275, and CMPUT 272

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

- **Instructor(s):**
  Levi Santana de Lelis (teaching in Winter Term 2024), Instructor(s) undecided for Fall Term 2024

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

- **Course Difficulty:**

  The course CMPUT 366 is on the easier side as long as you can understand the theory. It gets more difficult when it gets to the neural network stuff in the last quarter of the course but until then it's smooth sailing. The final exam is also considered fair by past students.

CMPUT 391

- **Course Description:**
  This course covers the implementation of RDBMSs and some non- relational data models, along with their query languages. Topics: compilation, execution, and optimization of SQL queries; concurrent execution of transactions; indexing; advanced constructs in SQL; semi-structured data models and query languages; distributed and parallel databases; NoSQL and cloud-based database systems.

- **Prerequisites:**
  CMPUT 201 and 204, or 275; and CMPUT 291

- **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

CMPUT 411

- **Course Description:**
  2D and 3D transformation; 3D modeling and viewing; illumination models and shading methods; texture mapping; ray tracing.

- **Prerequisites:**
  CMPUT 204 or 275, 301; one of CMPUT 340, 418 or equivalent knowledge, and MATH 214

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

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

- **Instructor ratings:**
  Pierre Boulanger's Rate My Professor rating is 2.8/5

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

CMPUT 415

- **Course Description:**
  Compilers, interpreters, lexical analysis, syntax analysis, syntax- directed translation, symbol tables, type checking, flow analysis, code generation, code optimization.

- **Prerequisites:**
  one of CMPUT 229, E E 380, or ECE 212, and any 300-level Computing Science course

- **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:**

  CMPUT 415 is a difficult course with a high workload. It is a software engineering course with a very large project scope, and you will learn to architect something on a grand scale. The course material is now in C++ and there are a couple of important tools you use that make the assignments significantly easier than they were before. However, the workload is still quite high and by far this course has the most amount of work than any other. The course attracts high achievers and people with at least some interest in compilers. There are 4 projects and each ramp up in scale and sophistication significantly. The first 2 are individual, the 3rd is in pairs, and the 4th is groups of 4. The final project is to implement a LLVM based compiler for some defunct IBM language that got designed but never actually implemented. It's a full blown language though, and most groups didn't finish all the features. Make sure you know Java, that's probably the most important thing. If you want to go a step further start reviewing different assembly dialects. Also look up how to use Antlr (parser generator) and LLVM (Intermediate Language). The workload never lets up, you constantly need to be working on stuff, as soon as an assignment is done it's in your best interest to start working on the next one. The course is worth taking despite its difficulty.

CMPUT 466

- **Course Description:**
  Learning is essential for many real-world tasks, including recognition, diagnosis, forecasting and data-mining. This course covers a variety of learning scenarios (supervised, unsupervised and partially supervised), as well as foundational methods for regression, classification, dimensionality reduction and modeling. Techniques such as kernels, optimization and probabilistic graphical models will typically be introduced. It will also provide the formal foundations for understanding when learning is possible and practical. Credit cannot be obtained for both CMPUT 367 and CMPUT 466.

- **Prerequisites:**
  CMPUT 204 or 275; MATH 125; CMPUT 267 or MATH 214; or consent of the instructor

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

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

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

- **Course Difficulty:**
  466 is a course meant for beginners with no prior experience. However, it is still a difficult course that requires a strong math and statistics background. It is not recommended for those who hate math and theory. The course consists of a lot of calculus and statistics. If you are interested in machine learning, you will need to take more than just 466, as there are several prerequisites such as STAT 265, 266, 371, and 372. If you are awful with stats, you may want to avoid this course. The course consists of 3 assignments, 2 exams, a final project, and weekly "thought questions". The final project is quite easy and can be a lot of fun if you let it. The assignments can be pretty challenging, especially for those who struggle with calculus, probability theory, and python programming. The exams are open-ended and require intuiting machine learning and being able to communicate it clearly. It is recommended to take 366 instead if you lack the prerequisites, as it is a more toned down version of 466.

ECE 303

- **Course Description:**
  Differential amplifiers. Frequency response: active device high-frequency behaviour and circuit models; amplifier circuits and design. Feedback: concepts and structure; feedback topologies and amplifiers; open- and closed-loop response. Operational amplifiers: behaviour, circuit analysis and design. Requires payment of additional student instructional support fees. Refer to the Tuition and Fees page in the University Regulations section of the Calendar. Credit may be obtained in only one of ECE 303 or E E 350.

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

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

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

- **Instructor ratings:**
  Zhenyu Zhang's Rate My Professor rating is 4.3/5

- **Course Difficulty:**

  The course is not very difficult. The professor expects everyone to get at least a C. However, the course is a mess and the professor is making up a lot of it as they go. The professor mentioned a book on matrix algebra and transistor circuits, but it is unclear how much this book is used in the course. Overall, the course is not very difficult, but it may be disorganized.

ECE 321

- **Course Description:**
  Software quality attributes. Software requirements. Requirements elicitation via interviewing, workshops, prototyping, and use case analysis. Vision document and Software Requirement Specification document standards. Formal software specification methods including operational and descriptive models. Design by contract. Verification and validation of requirements. Credit may be obtained in only one of CMPE 310 or ECE 321.

- **Prerequisite:**
  CMPUT 275

- **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 321 is not a difficult course. The instructor focuses on understanding the material rather than memorization. The course includes some theory and design work. Labs involve working on a project with teammates for the whole semester. The course is interactive and fun."

ECE 360

- **Course Description:**
  Linear system models. Time response and stability. Block diagrams and signal flow graphs. Feedback control system characteristics. Dynamic compensation. Root locus analysis and design. Frequency response analysis and design. Credit may be obtained in only one of ECE 360, ECE 362, E E 357, E E 462 or E E 469.

- **Prerequisites:**
  ECE 203 or E E 250, and ECE 240 or E E 238

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

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

- **Instructor ratings:**
  Tongwen Chen's Rate My Professor rating is 2.9/5

- **Course Difficulty:**

  ECE 360, also known as Multimedia Signal Processing, is considered to be the easiest course on the list of electives provided.

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:**
  ECE 380 is a difficult course and it is recommended to book time with the professor or a TA to fully understand the concepts.

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 442 is a course that is considered to be easy. It is an elective that goes in depth about machine learning and multimedia signal processing.

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:**

  The course ECE 405 is not a popular course, as there has not been a single student enrolled in it for over a decade. However, there is currently a student taking the course. The course is a time crunch, as the student is reviewing the practice midterm from 2011 and finding it difficult. The course is dry but interesting in applications, with a lot of calculations and theoretical questions on assignments and exams. Overall, the course seems to be quite difficult.

ECE 406

- **Course Description:**
  This course is 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 the Department of Computing Science 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:**
  Insufficient information available on course difficulty

ECE 407

- **Course Description:**
  This course is 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 the Department of Computing Science 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 412

- **Course Description:**
  Defects in manufacturing, failure mechanisms, and fault modeling. Reliability and availability theory. Static and dynamic redundancy and repair. Error correcting codes and self-checking systems. Roll-back strategies. Fault-tolerant computers and network architecture. Credit may be obtained in only one of CMPE 425 or ECE 412.

- **Prerequisite:**
  ECE 342

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

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

- **Instructor ratings:**
  Jie Han's Rate My Professor rating is 3.4/5

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

ECE 421

- **Course Description:**
  Advanced programming concepts. Programming language as a vehicle for discussion about programming concepts such as productivity, components and re-use, traditional vs. scripting approaches. Object oriented construction, systems programming, concurrent programming, Graphical User Interface (GUI) programming, distributed programming, and dynamic programming. Credit may be obtained in only one of CMPE 410 or ECE 421.

- **Prerequisites:**
  ECE 322 or CMPE 320, ECE 325, CMPUT 301 and CMPUT 379

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

- **Instructor(s):**
  Ronald Unrau (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 423

- **Course Description:**
  Topics include distributed communication models (e.g., sockets, remote procedure calls, distributed shared memory), distributed synchronization (clock synchronization, logical clocks, distributed mutex), distributed file systems, replication, consistency models, fault tolerance, QoS and performance, scheduling, concurrency, agreement and commitment, Paxos-based consensus, MapReduce and NoSQL datastores, cloud infrastructures and microservices.

- **Prerequisites:**
  CMPUT 379 and (ECE 487 or CMPUT 313)

- **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 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 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:**
  Li Cheng's Rate My Professor rating is 2.5/5

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

- **Course Difficulty:**

  ECE 447 is a brand new course, so it may be a bit disorganized. However, the course is not too difficult, with easy assessments and a great professor. The course provides a basic introduction to machine learning and some hands-on experience with data analysis. If you are in software engineering, the programming should not be too challenging.

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:**

  "ECE 449 is not a difficult course in terms of lab work, as it is mostly programming labs and does not require a lab kit. However, it is important to note that for your capstone project, you may need to use some of the components from the lab room, either at your place or bringing them in when you start prototyping."

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:**

  "ECE 450 is a moderately difficult course. It requires a strong understanding of the material from ECE 250 and ECE 350. The course is very theoretical and requires a lot of proofs and derivations. The exams are difficult and require a lot of preparation. The course is not impossible to do well in, but it does require a lot of work and dedication."

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:**

  The difficulty of ECE 455 is not explicitly stated in the comments, but it is implied to be difficult. A friend of one of the commenters described the class as "absolute ass". However, it is possible to take a different elective, such as ECE 442, which is described as "the most fun and interesting elective on that list" and "probably the easiest on this list". It may be worth considering taking ECE 442 instead of ECE 455 if possible.

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 course ECE 456 is difficult to judge in terms of difficulty, as there is no clear consensus on the course's difficulty. The syllabus does not provide enough information to determine the difficulty of the course, and the professor has not provided a clear date for when important information will be released. The course is an undergraduate course in the Faculty of Engineering.

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