Project Course	Description	Faculty	Email Address
AERO 481: Aircraft Design (4)	Multidisciplinary integration of aerodynamics, performance, stability and control, propulsion, structures and aeroelasticity in a system approach aimed at designing an aircraft for a set of specifications. Includes weight estimates, configuration and power plant selection, tail-sizing, maneuver and gust diagrams, wing loading, structural and aeroelastic analysis. Students work in teams on the design project.	Carlos Cesnik Quim Martins	cesnik@umich.edu jrram@umich.edu
AERO 483: Space System Design (4)	Introduction to the engineering design process for space systems. Includes a lecture phase that covers mission planning, launch vehicle integration, propulsion, power systems, communications, budgeting, and reliability. Subsequently, students experience the latest practices in space-systems engineering by forming into mission-component teams and collectively designing a space mission. Effective team and communication skills are emphasized. Report writing and presentations are required throughout, culminating in the final report and public presentation.	James Cutler	jwcutler@umich.edu
BME450/499: Semester (4)/Year Long (5) Senior Capstone Design (4)	Both BME 450 and 499 expose students to the entire design process from problem definition to prototype validation. The course is organized like a biomedical engineering company with projects sponsored by real clients and the primary mode of project instruction facilitated through weekly team meetings with the instructors (i.e. the teams' engineering manager). Design teams, consisting of six students, work through identification of client need, development of design specifications, brainstorming, concept generation and evaluation, detailed design, fabrication, and prototype validation. In addition to these technical concepts, students learn and practice project management, maintenance of engineering and project notebooks, budgeting, FDA regulations, and technical communications.	Rachael Schmedlen	shope@umich.edu
ChemE 487: Process Simulation and Design (5)	Process conceptualization and design. It requires an industrial quality, preliminary design of a process unit utilizing simulation, as appropriate. Capital cost estimation, development of operating economics and profitability analysis are required. Results are presented in a comprehensive technical report and an oral presentation.	Johannes Schwank Barry Barkel	schwank@umich.edu bmbarkel@umich.edu

CEE 402: Professional Issues and Design (4)	Multidisciplinary team design experience including consideration of codes, regulations, alternate solutions, economic factors, sustainability, constructability, reliability, and aesthetics in the solution of a civil or environmental engineering problem. Professionalism and ethics in the practice of engineering.	James Wight	jwight@umich.edu
EECS 411: Microwave Circuits I (4)	Transmission-line theory, microstrip and coplanar lines, S-parameters, signal-flow graphs, matching networks, directional couplers, low-pass and band-pass filters, diode detectors. Design, fabrication, and measurements (1-10GHz) of microwave-integrated circuits using CAD tools and network analyzers.	Amir Mortazawi	amirm@umich.edu
EECS 413: Monolithic Amplifier Circuits (4)	Analysis and design of BJT and MOS multi-transistor amplifiers. Feedback theory and application to feedback amplifiers. Stability considerations, pole-zero cancellation, root locus techniques in feedback amplifiers. Detailed analysis and design of BJT and MOS integrated operational amplifiers. Lectures and laboratory.	Michael Flynn	mpflynn@umich.edu
EECS 425: Integrated Microsystems Laboratory (4)	Development of a complete integrated microsystem, from functional definition to final test. MEMS-based transducer design and electrical, mechanical and thermal limits. Design of MOS interface circuits. MEMS and MOS chip fabrication. Mask making, pattern transfer, oxidation, ion implantation and metallization. Packaging and testing challenges. Students work in interdisciplinary teams.	Euisik Yoon	esyoon@umich.edu
EECS 427: VLSI Design I (4)	Design techniques for rapid implementations of very large-scale integrated (VLSI) circuits, MOS technology and logic. Structured design. Design rules, layout procedures. Design aids: layout, design rule checking, logic, and circuit simulation. Timing. Testability. Architectures for VLSI. Projects to develop and lay out circuits.	Zhengya Zhang	zhengya@umich.edu
EECS 430 (AOSS 431): Radiowave Propagation and Link Design (4)	Fundamentals of electromagnetic wave propagation in the ionosphere, the troposphere, and near the Earth. Student teams will develop practical radio link designs and demonstrate critical technologies. Simple antennas, noise, diffraction, refraction, absorption, multi-path interference, and scattering are studied.	Brian Gilchrist	gilchrst@umich.edu

EECS 438: Advanced Lasers and Optics Laboratory (4)	Construction and design of lasers; gaussian beams; nonlinear optics; fiber optics; detectors; dispersion; Fourier optics; spectroscopy. Project requires the design and set-up of a practical optical system.	John Nees	nees@umich.edu
EECS 452: Digital Signal Processing Design Laboratory (4)	Architectures of single-chip DSP processors. Laboratory exercises using two state-of-the-art fixed-point processors; A/D and D/A conversion, digital wave-form generators, and real-time FIR and IIR filters. Central to this course is a team project in real-time DSP design (including software and hardware).	Mark Brehob Mingyan Liu	brehob@umich.edu mingyan@umich.edu
EECS 470: Computer Architecture (4)	Basic concepts of computer architecture and organization. Computer evolution. Design methodology. Performance evaluation. Elementary queuing models. CPU architecture instruction sets. ALU design. Hardware and micro-programmed control. Nanoprogramming. Memory hierarchies. Virtual memory. Cache design. Input-output architectures. Interrupts and DMA. I/O processors. Parallel processing. Pipelined processors. Multiprocessors.	Mark Brehob Thomas Wenisch	brehob@umich.edu twenisch@umich.edu
EECS 481: Software Engineering (4)	Professional problem-solving methods developed through intensive group studies. Normally one significant design project is chosen for entire class requiring multiple EECS disciplines and teams. Use of analytic, computer, design, and experimental techniques where applicable are used. Projects are often interdisciplinary allowing non-EECS seniors to also take the course (consult with instructor).	Dave Chesney	chesneyd@umich.edu
EECS 494: Computer Game Design and Development (4)	Concepts and methods for the design and development of computer games. Topics include: history of games, 2D graphics and animation, sprites, 3D animation, binary space partition trees, software engineering, game design, interactive fiction, user interfaces, artificial intelligence, game SDK's, networking, multi-player games, game development environments, commercialization of software.	John Laird	laird@umich.edu
EECS 497: Major Design Projects (4)	Pragmatic aspects of the production of software systems, dealing with structuring principles, design methodologies and informal analysis. Emphasis is given to development of large, complex software systems. A term project is usually required.	Elliot Soloway Mary Lou Dorf	soloway@umich.edu mdorf@umich.edu

EECS 583: Advanced Compilers (4)	In-depth study of compiler back-end design for high-performance architectures. Topics include control-flow and data-flow analysis, optimization, instruction scheduling, register allocation. Advanced topics include memory hierarchy management, instruction-level parallelism, predicated and speculative execution. The class focus is processor-specific compilation techniques, thus familiarity with both computer architecture and compilers is recommended.	Scott Mahlke	mahlke@umich.edu
IOE 424: Practicum in Production and Service Systems – Senior Design Project Course (4)	Student teams will work with an organization on an Industrial and Operations Engineering design project with potential benefit to the organization and the students. The final report should demonstrate a mastery of the established technical communication skills. The report will be reviewed and edited to achieve this outcome.	J. Patrick Spicer	pspicer@umich.edu
IOE 481: Practicum in Hospital Systems (4)	Student team projects in hospital systems. Projects will be offered from areas of industrial and operations engineering, including work measurement and control, systems and procedures, management, organization and information systems. Lectures will deal with the hospital setting and project methodologies. The final report should demonstrate a mastery of the established technical communication skills. The report will be reviewed and edited to achieve the outcome.	Mark Van Oyen	vanoyen@umich.edu
IOE 499: Senior Design Projects	Selected design projects in industrial and operations engineering to be conducted for project sponsors. The final report submitted by the students should demonstrate a mastery of the established communication skills. The final project report will be reviewed to achieve this outcome.	?	
MSE 480: Materials and Engineering Design (3)	Design concepts. Engineering economics. Various design criteria, processes, and process control. Materials substitution. Competitive design. Case histories. Professional and ethical considerations. Written and oral presentations of solutions to design problems.	Richard Laine	talsdad@umich.edu

MSE 489: Materials Processing Design (3)	The design of production and refining systems for engineering materials. Design of problems for the extraction and refining of metals, production and processing of ceramics, polymeric materials, and electronic materials. Written and oral presentation of solutions to processing design problems.	Max Shtein	mshtein@umich.edu
ME 250: Design and Manufacturing I (4)	Basics of mechanical design: visual thinking, engineering drawing, and machine anatomy. Basics of manufacturing: processes, materials, and thermofluid aspects. Use of computers in various phases of design and manufacturing. Exposure to CAD systems and basic machine shop techniques. Design/manufacturing project. Three hours lecture and two hours laboratory.	John Hart Kazuhiro Saitou	ajohnh@umich.edu kazu@umich.edu
ME 350: Design and Manufacturing II (4)	Principles of mechanical design and manufacturing. Analysis, synthesis and selection of mechanisms, machine components and associated manufacturing processes. Design projects. Three hour lecture and one two-hour lab.	Shorya Awtar Albert Shih	awtar@umich.edu shiha@umich.edu
ME 450: Capstone Design and Manufacturing Experience	A mechanical engineering design project by which the student is exposed to the design process from concept through analysis to layout and report. Projects are proposed from the different areas of study within mechanical engineering and reflect the expertise of instructing faculty. Three hours of lecture and two laboratories.	Steve Skerlos Gordon Krauss Albert Shih Kathleen Sienko Nick Chronis Yoram Koren Brent Gillespie Shorya Awtar Alan Wineman Katsuo Kurabayashi	skerlos@umich.edu gkrauss@umich.edu shiha@umich.edu sienko@umich.edu chronis@umich.edu ykoren@umich.edu brentg@umich.edu awtar@umich.edu lardan@umich.edu katsuo@umich.edu
NA 475: Marine Design Team Project (4)	Small teams of up to 4 students create, develop, and document original marine designs to contract design level. Projects typically involve a ship, yacht, submersible, or offshore system. Involves extensive project planning and weekly progress reporting. Extensive written and oral presentation of the project. Significant design CAD effort.	Matt Collette	mdcoll@umich.edu

NERS 442: Nuclear Power Reactors (4)	Analysis of nuclear fission power systems including an introduction to nuclear reactor design, reactivity control, steady-state thermal-hydraulics and reactivity feedback, fuel cycle analysis and fuel management, environmental impact and plant siting, and transient analysis of nuclear systems. A semester-long design project of the student's choice.	John Lee	jcl@umich.edu
NERS 554: Radiation Shielding (4)	The design of radiation shields, including neutrons, photons and charged particles. Dosimetric quantities, detector response functions, materials selection, and energy deposition in shields. Techniques for dose estimation including buildup factors, neutron removal cross-sections and Monte Carlo.	Sara Pozzi	pozzisa@umich.edu
ENG 355: Multidisciplinary Engineering Design I (1-4)	First part of a challenging capstone multidisciplinary team-based design project, including the Multidisciplinary Design Minor. Students participate in the conception, scoping, and preliminary design of innovative engineering projects. The designs are refined and prototypes can be fabricated and tested in Engr 455. Includes mentors and guest lecturers from academia, industry, and government laboratories.	Steve Skerlos Brian Gilchrist Nilton Renno Peter Washabaugh Will Hansen James Cutler Aaron Ridley Jason McCormick Margaret Wooldridge Ryan Eustice David Wentzloff	skerlos@umich.edu gilchrst@umich.edu nrenno@umich.edu pete@umich.edu whansen@umich.edu jwcutler@umich.edu ridley@umich.edu jpmccorm@umich.edu mswool@umich.edu eustice@umich.edu wentzlof@umich.edu
ENG 450: Multidisciplinary Design (4)	A senior capstone interdisciplinary engineering design experience. The student is exposed to the design process from concept through analysis to system integration, prototyping, testing and report. Interdisciplinary projects are proposed from the different areas within engineering. Two hours of lecture and two laboratories.	Various (Nilton Renno)	nrenno@umich.edu

ENG 455: Multidisciplinary Engineering Design II (1-5)	Second part of a challenging capstone multidisciplinary design project, particularly for the Multidisciplinary Design Minor. Preliminary designs are refined and prototypes are fabricated and tested. Includes mentors and guest lecturers from academia, industry, and government laboratories.	Kathleen Sienko Steve Skerlos Brian Gilchrist Nilton Renno Peter Washabaugh Will Hansen James Cutler Aaron Ridley Pierre Kabamba Brent Gillespie Margaret Wooldridge Ryan Eustice Rachael Schmedlen	sienko@umich.edu skerlos@umich.edu gilchrst@umich.edu nrenno@umich.edu pete@umich.edu whansen@umich.edu jwcutler@umich.edu ridley@umich.edu kabamba@umich.edu brentg@umich.edu mswool@umich.edu eustice@umich.edu shope@umich.edu
AOSS 477: Space Weather Modeling		Mark Moldwin	mmoldwin@umich.edu
AOSS 480: Climate Change: Move to Action		Richard Rood	rbrood@umich.edu