ENGD - ENGINEERING DESIGN (ENGD)

ENGD 100 - Design & Communication Studio 8 Credits

Hours: 6R-10L-8C
Term Available: F
Graduate Studies Eligible: No
Prerequisites: None

ENGD 101 - Representations of Design Studio 2 Credits

Hours: 1R-5L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

ENGD 102 - Design Realization Studio 2 Credits

Hours: 1R-5L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

ENGD 103 - Designing for Disabilities Studio 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

ENGD 110 - Static Analysis, Testing, and Sociotechnical Thinking 6 Credits

Hours: 4R-12L-6C
Term Available: W
Graduate Studies Eligible: No
Prerequisites: MA 111 or MA 105

Extends the design process to include testing, modeling, iteration, and social contexts and values. Applies methods of Science, Technology, and Society (STS) to consider engineering thinking and engineering education in social and historical contexts, including institutional values and norms. Introduces the principles of static equilibrium and their applications in two and three-dimensional engineering systems. Topics covered include vector analysis, free-body diagrams, particle and rigid body equilibrium, and the structural analysis of frames and machines. Fundamental topics related to the elastic behavior of engineering materials under axial loading are introduced. Design testing is required. Students may not receive credit towards graduation for both ENGD110 and any of BE 122,EM 120, or EM 121

ENGD 111 - Sociotechnical Thinking in Design 2 Credits

Hours: 2R-0L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

Applies methods of Science, Technology, and Society (STS) to consider engineering thinking and engineering education in social and historical contexts, including institutional values and norms. Successful completion of ENGD 111 and ENGD 121 satisfies the requirements of HUM H190.

ENGD 112 - DC Circuits 2 Credits

Hours: 1R-3L-2C
Term Available: W
Graduate Studies Eligible: No
Prerequisites: None

ENGD 113 - Software Development Principles I 2 Credits

Hours: 1R-3L-2C
Term Available: W
Graduate Studies Eligible: No
Prerequisites: None

ENGD 120 - Integrating Electrical, Software, and Societal Systems 6 Credits

Hours: 4R-12L-6C
Term Available: S
Graduate Studies Eligible: No
Prerequisites: ENGD 110

Continues the design process, within cultural, historical, and social contexts and values, with software development and instrumentation and measurement techniques. Adds more advanced programming concepts (implicit loops and conditionals) and tasks of software development (such as development of user interfaces). Includes use of electronic components (op amps, capacitors, inductors) and signal processing (amplifiers and filters). Evaluates and revises the technical objectives of course projects within social and human-centered conceptions of design and engineering, continuing the study of Science, Technology, and Society (STS). Students may not receive credit towards graduation for ENGD120 and either CSSE120, or ES213. Successful completion of ENGD110 and ENGD120 satisfies the requirements of BE 131, ES213, ES213L, CSSE120, and HUM H190.

ENGD 121 - Science, Technology, and Society in Design 2 Credits

Hours: 2R-0L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ENGD 110 or ENGD 111

Evaluates and revises the technical objectives of course projects within social and human-centered conceptions of design and engineering, continuing the study of Science, Technology, and Society (STS). Scheduled with ENGD 122 and ENGD 123. Successful completion of ENGD 111 and ENGD 121 satisfies the requirements of HUM H190.

ENGD 122 - AC Circuits 2 Credits

Hours: 1R-6L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ENGD 110 or BE 121 or ENGD 112

ENGD 123 - Software Development Principles II 2 Credits

Hours: 1R-6L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ENGD 110 or ENGD 113

ENGD 150 - Independent Design Project 2 Credits

Hours: 1R-2L-2C
Term Available: S
Graduate Studies Eligible: No
Prerequisites: None

Selected design projects. May include computer-aided design, testing, or design methodology. Degree plan of study must be created.

ENGD 190 - Selected Topics in Engineering Design 1-6 Credits

Hours: 0R-0L-(1 - 6)C
Term Available: F,W,S
Graduate Studies Eligible: No
Prerequisites: None

ENGD 199 - Professional Experience 1 Credit

Hours: 1R-0L-1C
Term Available: F,W,S
Graduate Studies Eligible: No
Prerequisites: None

The professional experiences course captures the practical work experiences related to the student's academic discipline. Students are required to submit a formal document of their reflections, which communicates how their employment opportunity reinforced and enhanced their academic studies.

ENGD 240 - User-Experience Design Studio 6 Credits

Hours: 4R-12L-6C
Term Available: W
Graduate Studies Eligible: No
Prerequisites: ENGD 120

Provides students with instruction and practice in analyzing contexts, audiences, and genres.Stakeholder analysis will be emphasized. SCRUM project management techniques will be introduced. Object-oriented programming concepts, including the use of inheritance, interfaces, polymorphism, abstract data types, and encapsulation to enable software reuse and assist in software maintenance will be introduced. Habits of rhetorical analysis, skills in teaming and collaboration, and techniques for presenting content and evidence will be presented.Systems engineering models will be integrated with software development. User experience and usability testing will be emphasized.Students may not receive credit toward graduation for both ENGD 240 and either of RH 330 or CSSE 220.

ENGD 241 - Technical Communication in Design 2 Credits

Hours: 2R-0L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ENGD 121 and ENGD 123 or (ENGD 120 or HUM H190) and ENGD 123 or CSSE 120

Habits of rhetorical analysis, skills in teaming and collaboration, and techniques for presenting content and evidence will be presented. User experience and usability testing will be emphasized. Students may not receive credit toward graduation for both ENGD 241 and ENGL H290.

ENGD 242 - Design Thinking 2 Credits

Hours: 1R-6L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ENGD 121 and ENGD 123 or (ENGD 120 or HUM H190) and ENGD 123 or CSSE 120

This course expands design processes to include decision making, design of experiments, and additional processes for monitoring customer requirements.

ENGD 243 - Software Development Principles III 2 Credits

Hours: 1R-6L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

ENGD 250 - Human Computer Interfaces Studio 6 Credits

Hours: 4R-12L-6C
Term Available: S
Graduate Studies Eligible: No
Prerequisites: ENGD 240

Extends the design process to include development of human-computer (HCI) interfaces.Continues with object-oriented programming concepts such as use of common object-based data structures, including stacks, queues, lists, trees, sets, maps, and hash tables.Space/time efficiency analysis. Testing. Introduction to UML. Crafting documents to meet the demands and constraints of professional situations; integrating all stages of the writing process; and collaborating effectively within and across teams will be emphasized. Systems engineering models will be used. Successful completion of both ENGD 240 and ENGD 250 meet the prerequisite requirements of RH 330 and CSSE 220.Students may not receive credit toward graduation for both ENGD 250 and either of RH 330 or CSSE 220.

ENGD 251 - Technical Communication in Design II 2 Credits

Hours: 2R-0L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ENGD 240 or (CSSE 220 and ENGD 241) or (ENGD 241 and ENGD 243)

ENGD 252 - Design of Human-Computer Interfaces 2 Credits

Hours: 1R-6L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ENGD 240 or (CSSE 220 and ENGD 241) or (ENGD 241 and ENGD 243)

ENGD 253 - Software Development Principles 2 Credits

Hours: 1R-6L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ENGD 240 or (CSSE 220 and ENGD 241) or (ENGD 241 and ENGD 243)

ENGD 260 - Product Design Studio 8 Credits

Hours: 6R-10L-8C
Term Available: F
Graduate Studies Eligible: No
Prerequisites: ENGD 100 or (EM 103 and RH 131 or HUM H190 or ENGL H100) or (EM 104 and RH 131 or HUM H190 or ENGL H100) and (BE 122 or ENGD 110 or EM 120 or EM 121)

Continues the design process by examining the interactions between design and manufacturing from the designer's point of view. Common manufacturing processes will be introduced and design guidelines will be developed for each process. Emphasizes a systems engineering approach for new product development and integration of multiple subsystems. Applies several design methods to integrate concepts of form and function to realize value for the user. Explores the intersections of beauty and utility in design. Visceral, behavioral, and reflective aspects of emotional design are examined.

ENGD 270 - Application of Engineering Ethics 2 Credits

Hours: 1R-2L-2C
Term Available: S
Graduate Studies Eligible: No
Prerequisites: None

This course emphasizes ethics, professionalism, and codes and standards. Students apply concepts to an external situation.

ENGD 271 - Vertically Integrated Proj II 2 Credits

Hours: 1R-2L-2C
Term Available: W
Graduate Studies Eligible: No
Prerequisites: None

Students will design an experiment using appropriate statistical techniques and hardware, write a test plan for their experiment, conduct their test plan, and reflect on the results.

ENGD 290 - Selected Topics in Engineering Design 1-4 Credits

Hours: 0R-0L-(1 - 4)C
Term Available: F,W,S
Graduate Studies Eligible: No
Prerequisites: None

ENGD 300 - Design Methods 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ENGD 260

Explores a variety of engineering design processes. May emphasize certain phases of the design process such as stakeholder analysis, conceptual design, risk analysis, detail design, manufacturing, testing, validation, or recycling. Practicum learning outcomes must be approved by the Director of Engineering Design. ENGD 300 and ENGD 301 must be taken consecutively.

ENGD 301 - Creative Design 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None
Notes: ENGD major or consent of instructor

Introduces and applies creativity techniques to the student's work environment. Requires a design project.

ENGD 302 - Human Factors 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None
Notes: ENGD major or consent of instructor

Human factors engineering aims to improve human interaction with systems by enhancing safety (reducing the risk of injury), performance (increasing productivity), and satisfaction (acceptance, comfort). Students will learn and be able to identify critical human factors in a system that affect safety, performance, and satisfaction. Software system swill also be considered. Students may not receive credit for both ENGD 302 and EGMT 540.

ENGD 303 - Systems Architecture 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None
Notes: ENGD major or consent of instructor

This class will introduce students to the art and science of systems architecting, where systems architecting refers to uncovering the fundamental structure of a system (functional, physical, logical, operational) defined in terms of system's elements, interfaces, processes, constraints, and behaviors that must operate under specific requirements and constraints. Focus will be placed on investigating the broader meaning of architectures, as they relate to organizations and businesses, in addition to engineered systems and products. Students may not receive credit for ENGD 303 and either of EMGT 464 or EMGT 564.

ENGD 304 - Material Properties 2 Credits

Hours: 2R-0L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None
Notes: ENGD major or consent of instructor

Introduces properties of metals, ceramics, polymers, and composites. Describes the similarities and differences in the mechanical properties, structure, and processing. Relates material processing to properties through underlying material structure.

ENGD 305 - Material Selection 2 Credits

Hours: 2R-0L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None

Explains the definition of common mechanical properties and identifies when a property is important for a given component or application. Carries out design translation to define the function, constraints, objectives, and free variables of an engineering component. Selects the best material for a given application considering all classes of materials including metals, ceramics, polymers, and composites

ENGD 309 - Lean Manufacturing Kaizen Fundamentals 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ENGD 308
Notes: ENGD major or consent of instructor

This course introduces students to lean manufacturing - the identification of value and elimination of waste in a manufacturing process. The course will feature frequent assigned reading and discussion as well as factory simulations and projects. Students will develop a fundamental understanding of lean principles and will be able to apply their knowledge in any profession.

ENGD 310 - Design for Assembly 2 Credits

Hours: 2R-0L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: EM 204 or BE 118 or ENGD 101 or ENGD 100

Application of the Boothroyd and Dewhurst methods for estimating assembly costs and designing products for improved assembly and maintenance.

ENGD 311 - Tolerance Analysis and Application 2 Credits

Hours: 2R-0L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: EM 104 or ENGD 100

This is an introductory course in tolerance analysis. Students will perform tolerance calculations by hand and using CAD tools. Students will also use worst-case and statistically based techniques to analyze tolerance problems, assembly shift, and make design decisions.

ENGD 312 - Design for Stamping and Welding 2 Credits

Hours: 2R-0L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: EM 104 or ENGD 100 or BE 118 or ENGD 101

Introduction to methods and guidelines for designing sheet metal and welded parts. Students will analyze real parts and use CAD tools to design new parts.

ENGD 313 - Design for Metal Casting and Forming 2 Credits

Hours: 2R-0L-2C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: EM 104 or BE 118 or ENGD 100 or ENGD 101

Introduction to methods and guidelines for designing cast, forged, and comparable parts. Students will analyze real parts and use CAD tools to design new parts.

ENGD 315 - Measuring User Experience 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None
Notes: ENGD major or consent of instructor

This course discusses users' goals and needs interacting with products or systems. This course provides methods to quantify the user experience and includes the basics of design of experiments, collecting, analyzing, and presenting usability metrics. Topics include case studies discussing how organizations have successfully used usability metrics. Students may not receive undergraduate credit for both ENGD 315 and EMGT E542.

ENGD 321 - Practicum 1 1 Credit

Hours: 1R-0L-1C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: ENGD 100 or ENGD 110 or ENGD 120
Notes: Student must obtain professional work experience such as an internship or co-op.

Students will reflect on connections between their professional work experience and learning outcomes from studio. Furthermore, students will reflect on potential future applications of studio materials.

ENGD 322 - Practicum 2 1 Credit

Hours: 1R-0L-1C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None
Notes: Student must obtain professional work experience such as an internship or co-op; Co-requisites: Students must be enrolled in an appropriate elective course.

Students will apply course learning outcomes from their companion elective course to their professional work experience. Furthermore, students will reflect on future applications of elective course materials.

ENGD 323 - Practicum 3 1 Credit

Hours: 1R-0L-1C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: None
Notes: Student must obtain professional work experience such as an internship or co-op

Students will give examples of how their current professional work experiences support the program's student learning outcomes. In addition, students will indicate how professional work experiences map to selected design processes.

ENGD 390 - Selected Topics in Engineering Design 1-4 Credits

Hours: 0R-0L-(1 - 4)C
Term Available: F,W,S
Graduate Studies Eligible: No
Prerequisites: None

ENGD 410 - Capstone Design I 4 Credits

Hours: 4R-0L-4C
Term Available: See Department
Graduate Studies Eligible: No
Prerequisites: (BE 132 and EM 204 and ENGD 260) and (BE 211 or ME 321)

Engineering Design students are expected to take the multi-disciplinary capstone sequence. The purpose of this course is to document that students have the appropriate background to be prepared for capstone.

ENGD 490 - Selected Topics in Engineering Design 1-6 Credits

Hours: 0R-0L-(1 - 6)C
Term Available: F,W,S
Graduate Studies Eligible: No
Prerequisites: None