

ENGR 4010 (Fall, 1-3 credits) and ENGR 4020 (Spring, 1-3 credits) MULTIDISCIPLINARY DESIGN and DEVELOPMENT I and II

Course overview

A collaborative, multidisciplinary design thinking environment in which students develop solutions to the challenges of tomorrow; the primary objective is to provide students with an in-depth design experience reflective of contemporary professional practice. Key attributes include the multidisciplinary composition of design teams (students from any department within SEAS, Commerce, Architecture, the College, etc.), an emphasis on modern practice (e.g., concurrent engineering, total quality management, and consideration of the technological, organizational and cultural context) and realistic problems and client-stakeholders. A disciplined design/development process is followed that incorporates important activities of contextual analysis, problem definition, customer needs definition, concept generation and selection, product specification, modeling and engineering analysis, proof of concept prototyping, design verification, cost analysis and project management and scheduling.

An operational description of the courses

These courses guide students through design thinking (Figure 1).

DEFINE the challenge (6 weeks)

Student work begins once they organize into teams and begin to DEFINE a challenge space (i.e., a problem or opportunity) *of their own choosing*. After students have understood a challenge space through reflective thought, external research, and subject matter expert interviews, they move on to GENERATE & SELECT a set of design requirements and possible solution concepts.

GENERATE & SELECT solution requirements, concepts (6 weeks)

Requirements and solution concepts are developed via reflective thought, external research, and subject matter expert interviews. Requirements will include numerical specifications related to functional performance. A decision-matrix based process justifies the selection of a “most promising” solution concept for prototype-based exploration.

EXPLORE the most promising solution (18 weeks)

Having selected a “most promising” concept, teams create multiple physical and analytical (i.e., simulation-based) prototypes. Prototypes and related experiments must assess the ability of the selected concept to achieve some functional requirements specified in the GENERATE & SELECT stage. Students must demonstrate that their experiments represent rigorous, accurate evaluation of their solution concept. Students in ABET accredited programs must confirm that their prototyping and testing contributions will satisfy degree requirements.

REPORT & RECOMMEND on design viability and next steps (4 weeks)

Students assemble a final, comprehensive report that supports a clearly stated conclusion as to whether their design is confirmed, viable but flawed, or busted. They recommend next steps.

Assessment & Measurement

Design Reports (50%)

Oral and Poster Presentations (15%)

Professional communication & class participation (15%)

Design Notebook (10%)

Schedule Management (10%)

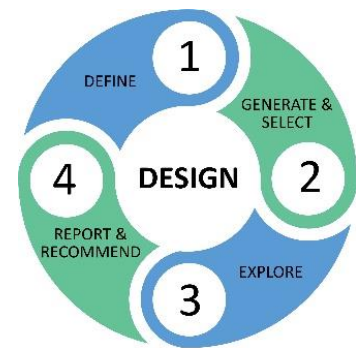


Fig. 1: The process of design thinking