



ENGI E1102

Design Fundamentals Using Advanced Computer Technologies

Fall 2009

Instructors:

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Course Description

All entering SEAS students are introduced to basic engineering design processes and complementary professional skills required for advancement in their engineering and applied science education and career. Students learn how to apply computer technologies such as advanced three-dimensional graphical and computational applications in the service of community design projects, using the state-of-the-art multimedia, interactive facility, the Botwinick Multimedia Learning Laboratory. Aligned with the technical components of the design, students develop collaboration, communication, problem solving, project management skills as well as a life-long orientation of social responsibility and community engagement.

Required Texts

Dieter, George E., & Schmidt, Lauren (2009). Engineering Design, Fourth Edition. McGraw Hill, Boston, MA.

McGourty, J. & DeMeuse, K. (2001). Team Developer: An Assessment and Skill Building Program. John Wiley & Sons, New York

Course Elements

E1102 Classroom:

Design Fundamentals and Skills (Interactive Lectures, Cases, & Activities)

[Friday Departmental Presentations/Modeling Support]

E1102 Laboratory:

Community Design Projects

Modeling Lectures and Assignments

Class Schedule:

Section 1 – T 1:00pm - 4:00pm, Room 1220

Section 2 – T 4:20pm - 7:20pm, Room 1220

Section 3 – M 1:00pm - 4:00pm, Room 1220

Section 4 – M 4:20pm - 7:20pm, Room 1220

[Departmental Presentations/Modeling Recitations – F 11:00am – 1:00pm]

Assignment Grades

Community Design Project = **550 points**

- Design Journal = 150 (5 assignments)
- Preliminary Design Proposal & Client Presentation (150)
- Final Design Report/Presentation/Deliverables (250)

Individual Modeling (20x7 assignments) & Midterm Exam (100) = **240 points**

Class Activities/Attendance = **210 points**

- Weekly Reflections = 65 (5x13 sessions)
- Design Fundamentals Midterm Exam = 100
- Friday Attendance = 10 (5x2 sessions w/reflections papers)
- Professional Developer = 15
- Course Evaluations = 20 (10x2 surveys)

Total Points = 1000

** NOTE: All assignments, lectures, grades, etc. are posted on courseworks.*

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| Week | What you will learn and do.... | Course Assignments Due |
|--|---|--|
| <p>#1</p> <p>Tues. 9/8/09</p> <p>Mon. 9/14/09</p> | <p>Introduction to Gateway and Engineering Design (180 mins)</p> <ul style="list-style-type: none"> ▪ Learning objectives of the course ▪ Specify project(s) requirements, assignments, and grading process ▪ Student feedback processes ▪ Academic integrity and teacher/student commitments ▪ Registration, log-in process, etc ▪ Introduction to lab policies and procedures | <p>Readings:</p> <ul style="list-style-type: none"> ▪ N/A <p>Assignments:</p> <ul style="list-style-type: none"> ▪ Weekly Reflection |
| <p>#2</p> <p>Tues. 9/15/09</p> <p>Mon. 9/21/09</p> | <p>Design Lectures: Introduction to the engineering design process (90 mins)</p> <ul style="list-style-type: none"> ▪ View IDEO video ▪ Define the key elements of the design process (Phases) ▪ Identify designer activities leading to effective designs ▪ Introduction to working on community-based design projects ▪ Discuss project expectations, including design journal, interim and final written report, presentations, and product deliverables ▪ Team roles and responsibilities <p>Modeling Sequence #1: Drawing 2D Lines (90 mins)</p> <p>[Friday 9/18/09 – Mechanical Engineering Department – 11:00am-Noon; Applied Physics/Mathematics Engineering Department – Noon-1pm]</p> | <p>Readings:</p> <ul style="list-style-type: none"> ▪ Chapters 1, 2 & 4 (pgs. 116 – 127; Sec 4. 1 – 4.6) in Dieter <p>Assignments:</p> <ul style="list-style-type: none"> ▪ Weekly Reflection |
| <p>#3</p> <p>Tues. 9/22/09</p> <p>Mon. 9/28/09</p> | <p>Design Lectures: Identifying customer requirements (90 mins)</p> <ul style="list-style-type: none"> ▪ Preliminary research guidelines including patent search, market research, technical issues, and community factors ▪ Introduction to market research techniques ▪ Methods for identifying customer needs ▪ Developing a structured customer requirements interview protocol ▪ Preparation for community client meeting <p>Meeting with Design Advisors</p> <ul style="list-style-type: none"> ▪ Description of community design project ▪ Assign community projects and teams <p>Modeling Sequence #2: Modeling with Primitives (90 mins)</p> <p>[Friday 9/25/09 – – Electrical Engineering Department – 11:00am-Noon; Biomedical Engineering Department – Noon-1pm]</p> | <p>Readings:</p> <ul style="list-style-type: none"> ▪ Chapters 4 (pgs. 126 – 144; Sec. 4.7) & 5 in Dieter <p>Assignments:</p> <ul style="list-style-type: none"> ▪ Weekly Reflection ▪ Modeling Assignment #1 |

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| <p>#4</p> <p>Tues. 9/29/09</p> <p>Mon. 10/5/09</p> | <p>Community Project: First client meeting (180 mins)</p> <p>Meeting with Design Advisors (to debrief client meetings)</p> <p>[Friday 10/2/09 – Earth & Environmental Engineering Department – 11:00am-Noon; Civil Engineering Department – Noon-1pm]</p> | <p>Readings:</p> <ul style="list-style-type: none"> ▪ Chapter 3 (pgs. 75-91; Sec. 3.1-3.3) in Dieter ▪ Chapter 7 in Team Developer <p>Assignments:</p> <ul style="list-style-type: none"> ▪ Weekly Reflection ▪ Design Journal #1 |
| <p>#5</p> <p>Tues. 10/6/09</p> <p>Mon. 10/12/09</p> | <p>Design Lectures: Overview of design specifications (75 mins)</p> <ul style="list-style-type: none"> ▪ Identifying the problem and creating formal problem statements ▪ Learning how to define functional requirements and design constraints based on a problem statement (Tools to support problem definition including objective trees, system sketching, and concept mapping) ▪ Mapping customer requirements to engineering characteristics ▪ Developing a product design specification document (PDS) <p>Community Project: Review criteria for midterm presentations (15 mins)</p> <p>Modeling Sequence #3: Generating Surfaces (90 mins)</p> <p>[Friday 10/9/09 – Computer Science Department – 11:00am-Noon; Computer Engineering – Noon-1pm]</p> | <p>Readings:</p> <ul style="list-style-type: none"> ▪ Chapters 3 (pgs. 109-111; Sec. 3.6), 8 & 9 (pgs. 387-401; Sec. 9.2-9.3) in Dieter <p>Assignments:</p> <ul style="list-style-type: none"> ▪ Weekly Reflection ▪ Modeling Assignment #2 |
| <p>#6</p> <p>Tues. 10/13/09</p> <p>Mon. 10/19/09</p> | <p>Design Lectures: Introduction to the project management in design context (60 mins)</p> <ul style="list-style-type: none"> ▪ Introduction to project management (PM) with focus on scheduling, Gantt charts, and critical path analysis ▪ Personal Gantt Charts using PM software (Weekly reflection) <p>Meeting with Design Advisors (30 mins)</p> <p>Modeling Sequence #4: Editing Surfaces (90 mins)</p> <p>[Friday 10/16/09 - Industrial Engineering/Operations Research Department – 11:00am-Noon; Chemical Engineering Department – Noon-1pm]</p> | <p>Readings:</p> <ul style="list-style-type: none"> ▪ Chapter 10 & 4 (pgs. 145 – 154; Sec. 4.8 – 4.9) in Dieter ▪ Chapters 1-4 in Team Developer <p>Assignments:</p> <ul style="list-style-type: none"> ▪ Weekly Reflection ▪ Design Journal #2 ▪ Modeling Assignment #3 |

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| <p>#7</p> <p>Tues. 10/20/09</p> <p>Mon. 10/26/09</p> | <p>Community Project: Preliminary design presentations to clients & debrief (90 mins)</p> <p>Modeling Sequence #5: Modeling and 3D Design for Manufacturing (90 mins)</p> | <p>Readings:</p> <ul style="list-style-type: none"> ▪ Chapters 6, 7, 11 in Dieter <p>Assignments:</p> <ul style="list-style-type: none"> ▪ Weekly Reflection ▪ Community Project: design presentations to clients ▪ Submit 10-page preliminary design proposal to client. Appendix to include copy of PowerPoint slides. ▪ Modeling Assignment #4 |
| <p>#8</p> <p>Tues. 10/27/09</p> <p>FALL BREAK</p> <p>Mon. 11/9/09</p> | <p>Student Feedback: Complete course survey in CourseWorks (30 mins)</p> <p>Community Project: Advisor meetings (60 mins)</p> <p>Modeling Sequence #6: Generating Polygons (90 mins)</p> | <p>Readings:</p> <ul style="list-style-type: none"> ▪ Chapter 13 in Dieter ▪ Chapters 5 in Team Developer <p>Assignments:</p> <ul style="list-style-type: none"> ▪ Weekly Reflection ▪ Design Journal Entry #3 ▪ Modeling Assignment #5 |
| <p>#9</p> <p>Tues. 11/10/09</p> <p>Mon. 11/16/09</p> | <p>Design Lectures: Seeking input and feedback throughout the design process (90 mins)</p> <ul style="list-style-type: none"> ▪ Review of course survey results (Weekly Reflection) ▪ Soliciting design feedback from all relevant stakeholders ▪ Introduction to Professional Developer feedback process (and student completion of PD) <p>Modeling Exam (90 mins)</p> | <p>Readings:</p> <ul style="list-style-type: none"> ▪ Chapters 8, 12 & 16 (pgs. 779-784, 789-795, 796-811; Sec. 16.1, 16.2, 16.5, 16.7-16.10) in Dieter <p>Assignments:</p> <ul style="list-style-type: none"> ▪ Weekly Reflection ▪ Modeling Assignment #6 ▪ Review for Modeling Exam |

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| <p>#10</p> <p>Tues. 11/17/09</p> <p>Mon. 11/23/09</p> | <p>Design Lectures: Design Phase #3: Presenting and implementing design (30 mins)</p> <ul style="list-style-type: none"> ▪ Effective reporting and presenting of engineering designs <p>Design Fundamentals Exam (based on lectures and textbook) (60 mins)</p> <p>Modeling Sequence #7: Lighting and Rendering (90 mins)</p> | <p>Readings:</p> <ul style="list-style-type: none"> ▪ Chapters 14 & 15 in Dieter ▪ Chapter 6 in Team Developer <p>Assignments</p> <ul style="list-style-type: none"> ▪ Weekly Reflection ▪ Design Journal Entry #4 |
| <p>#11</p> <p>Tues. 11/24/09</p> <p>Mon. 11/30/09</p> | <p>Design Lectures: Sustainability in Design (45 mins)</p> <ul style="list-style-type: none"> ▪ Cradle-to-cradle design ▪ Key principles of universal design ▪ Addressing safety, reliability, risk, and ethics ▪ Review of final design report criteria <p>Community Project: Work with advisors in preparation for final presentation and deliverables (45 mins)</p> <p>Modeling Sequence #8: Workshop: Work on final project (90 mins)</p> | <p>Readings:</p> <ul style="list-style-type: none"> ▪ Chapters 9.3 (pgs. 391-401; Sec. 9.3) & 17 (online only www.mhhe.com/dieter) in Dieter <p>Assignments:</p> <ul style="list-style-type: none"> ▪ Weekly Reflection ▪ Modeling Assignment #7 |
| <p>#12</p> <p>Tues. 12/1/09</p> <p>Mon. 12/7/09</p> | <p>Student final course evaluation survey in Courseworks (30 mins)</p> <p>Community Project: Work with advisors in preparation for final presentation and deliverables (60 mins)</p> <p>Modeling Sequence #9: Workshop: Work on final project (90 mins)</p> | <p>Readings:</p> <ul style="list-style-type: none"> ▪ N/A <p>Assignments:</p> <ul style="list-style-type: none"> ▪ Weekly Reflection ▪ Design Journal Entry # 5 |
| <p>#13</p> <p>Tues. 12/8/09</p> <p>Mon. 12/14/09</p> | <p>Community Project: Final design presentations to clients (135 mins)</p> <p>Client/Team debrief sessions and formal delivery of final product (45 mins)</p> | <p>Assignments:</p> <ul style="list-style-type: none"> ▪ Weekly Reflection ▪ Community Project – Final Design Report Due; final PowerPoint presentations; all project files, materials and deliverables for community partners and instructors. |