Course number and name

Materials Science and Engineering Senior Design I (MTSE4090)

Credits and contact hours

2 Credits. W 11:00-12:00 hrs; Additional hour with advisor

Instructor’s or course coordinator’s name

Instructor: Dr. Nigel Shepherd

Text book, title, author, and year

a. Other supplemental materials
   Lecture slides and notes – this will be a major source

Specific Course Information

a. Brief description of the content of the course (catalog description)
   The primary objective of this course is to provide every student with experience in “real world”
   engineering design that draws on many of the skills that have been mastered during their studies
   in the Department of Materials Science and Engineering at the University of North Texas. Students
   will exhibit an ability to design a system, component, or process to meet a desired need. This is a
   two course sequence with the first course (this course, MTSE4090) providing the preliminary work
   required to complete a design project (determining project scope, technical background and
   literature review, planning a project, considering safety, environmental and ethics in design,
   preliminary design and presenting design work both orally and in writing).

b. Prerequisites or co-requisites
   MTSE 3010, MTSE 3020, MTSE 3030, MTSE 3040, MTSE 3050, MTSE 3070, MTSE 3080.

c. Indicate whether a required, elective, or selected elective course in the program
   Required

Specific goals for the course

a. Specific outcomes of instruction
   • Students are expected to function in an environment that is more similar to that which they will
     encounter in their careers outside the university setting. As such, instructors have two main
     functions: to serve as advisors to the senior design student/teams and as evaluators of
     student/team progress.
   • Students are expected to operate effectively either as an individual or in a team environment;
     team evaluations will be compiled at the end of the semester using the attached rubric.
   • Students will succeed by exhibiting an ability to apply and integrate knowledge of material
     structure, properties, processing and performance for a materials selection and process design
     problem.
   • Students should consider additional aspects such as the economic, environmental, ethical,
     safety as well as social and political impacts of the effort.
b. *Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.*

This course addresses ABET Student Outcome(s): c, d, f, g, h, i

**Course Schedule:** Meets every Wednesday at 11:00hrs in D212

- **8/27/15:** Project assignments, introduction, course expectations
- **9/2/15:** Introduction to project management; Gathering technical information, including patents and standards (Dr. Young)
- **9/9/15:** Use of Granta Software for Materials Design (Prof. Srivilliputhur)
- **9/16/15:** Use of Granta Software for Materials Design (Prof. Srivilliputhur)
- **9/23/15:** Individuals/Groups present progress report to advisors
- **9/30/15:** *Project definition DUE* – Report & 5 min presentation to advisory groups, questions and answers
- **10/7/15:** Introduction to the safety and environment aspects of design. Standards and Constraints.
- **10/14/15:** Engineering and business ethics (Zhiqiang Wang)
- **10/21/15:** Groups present progress report to advisors
- **10/28/15:** *Background Report & Team Evaluations DUE* – Report & 5 min presentation to advisory groups, questions and answers
- **11/4/15:** Review
- **11/11/15:** Groups present progress report to advisors
- **11/18/15:** *Draft Final Report DUE* – progress meeting with advisors Groups present draft Poster & Defense to advisors
- **12/2/15:** *Final Report & Team Evaluations DUE, Poster Presentation and Defense*  

**Grading:**

Students will be evaluated based on homework assignments related to classroom lectures, attendance and progress reports submitted to advisors, team evaluations, prepared presentations and written reports. Grades will be assigned for each task and group members will evaluate the group’s performance during the semester. Points will be based on the following:

<table>
<thead>
<tr>
<th>Homework assignment</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>Homework assignments</td>
<td>50</td>
</tr>
<tr>
<td>Project Definition Report/Presentation (from advisory group)</td>
<td>25</td>
</tr>
<tr>
<td>Background Report (Project background and state of the art literature review)</td>
<td>100</td>
</tr>
<tr>
<td>Draft Final Report (Project background, literature, plan, progress and next semester)</td>
<td>25</td>
</tr>
<tr>
<td>Poster Presentation and Defense</td>
<td>100</td>
</tr>
<tr>
<td>Final Report (Project background, literature, plan, progress and next semester)</td>
<td>100</td>
</tr>
</tbody>
</table>

Grades will be assigned using the following scale:  
A>90%>B>80%>C>70%>D>60%>F

Groups are responsible for planning and coordinating meetings outside of the classroom that are required for completing the project, and, for scheduling time with the faculty advisor and industrial sponsor (if appropriate). Review the educational objectives carefully to determine additional details that should be considered in all senior design presentations and written reports.
Student Design Teams are responsible for a series of written reports that build on the previous one in completing the final reports that will be submitted at the end of each semester.

First, the Project Definition Report/Presentation (25 points) should focus on the Goals and Objectives of the project including the problem definition, scope of work, major challenges and general plan to complete the project. This should be detailed in the written report and outlined in a PowerPoint Presentation to the faculty **(DUE September 30th)**.

Second, the Background Report (100 points) should start with a revised Goals and Objectives and includes a thorough “state of the art” literature and background search of all pertinent sources (journals, proceedings, handbooks, patents, internet, industrial literature, industrial visits, existing data, internal documents, etc.). The background literature and information should be evaluated in light of your project to provide the overall direction and ideas for the project. This report will also include the plan for the preliminary work to be completed before the end of the semester. This will include a detailed written report and an outline in a PowerPoint Presentation to the faculty **(DUE October 28th)**.

Third, a Final Report (25 point Draft and 100 point Final) should be built on the first reports and revisions suggested by your advisor group. The first written draft of this report is due November 20th and the final written report is due with your poster on **(DUE November 18th)**. The final written report describes in detail the following aspects of the project:

- Goals and Objectives- based on the ‘Problem Definition and Scope” determined with your faculty advisor in October;
- Background Information- including that information developed, revised and updated for the October ‘State-of-the-Art’ literature review;
- Clearly identified standards and constraints;
- The engineering approach planned to meet the goals and objectives;
- A discussion of the preliminary work done this semester;
- A detailed plan for work to be accomplished next semester, including
  - Specific tasks and anticipated timelines, including milestones (use GANTT chart)
  - Anticipated budgets.

Students are encouraged to consider the potential environmental and societal impacts of their design project, in addition to the technical objectives and approach. Each of the written reports will be graded by the design team advisor group.

The style of each report is open, but every written report should include a cover page with the title of the project, the names of the design team members, the faculty advisor, industrial sponsor/contact person and the date.

The Student Design Teams also will be responsible for a 3’ x 4’ poster that summarizes the written report and that includes the same project aspects that are described above. Students will use the PowerPoint template provided. **The posters will be displayed on the design evaluation day (TBD)**. The design teams will be interviewed by MSE faculty members who will judge each project based on the aspects described above. The design teams will have their written report available for the faculty judges to provide additional information as needed. These interviews and the poster presentation will be worth 100 points, as tallied from the faculty score sheets. An example of a faculty score sheet is attached. Please contact Erik Forney (MSE Office) for information about printing posters prior to the departmental review using the template provided.
Background Report grades will be based on both writing and technical quality. This rubric will be used as part of the faculty evaluation of the Literature Review section of the Background Report for your project.

<table>
<thead>
<tr>
<th></th>
<th>Unsatisfactory 1</th>
<th>Developing 2</th>
<th>Satisfactory 3</th>
<th>Outstanding 4</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standards and Reference Data</strong></td>
<td>Identified no standards or reference data</td>
<td>Identified one or two standards or reference data examples, of limited value</td>
<td>Identified one or two standards or reference data examples appropriate for project</td>
<td>Identified more than two standards or reference data examples appropriate for project</td>
<td></td>
</tr>
<tr>
<td><strong>Technical Literature Review- Journals</strong></td>
<td>Technical references are of little value to the project</td>
<td>Some useful technical references identified, but incomplete</td>
<td>Most technical references are relevant</td>
<td>Technical references are appropriate, includes information new to sponsor or advisor</td>
<td></td>
</tr>
<tr>
<td><strong>Other Technical Information, Including Patents</strong></td>
<td>Identified no supplementary information</td>
<td>Identified one or two examples, but of limited value</td>
<td>Identified one or two examples appropriate for project</td>
<td>Identified more than two examples appropriate for project</td>
<td></td>
</tr>
<tr>
<td><strong>Overall Relevance of Literature Review Document</strong></td>
<td>Not connected to desired project goal; mostly irrelevant information</td>
<td>Some useful information, but connection to project goal is unclear</td>
<td>Most information is relevant to a well-described project goal</td>
<td>Information is clearly relevant to a well-described project goal</td>
<td>(Double these points)</td>
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| **Overall Quality of Literature Review Document** | Poorly written, poorly laid-out; limited or no figures; improper citations | Some problems with grammar, some sections written unclearly; figures not well-described; problems with citations | Well-written, with reasonable clarity, useful figures, good use of citations; room for improvement | Very well-written with appropriate figures to supplement text and well-organized citations | (Double these points) |

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<th></th>
<th>Total Score</th>
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Comments:
Project Title: ___________________________________________________

**Goals and Objectives**: well defined problem, adequate performance characteristics, and reasonable scope (maximum of 15 points): __________

Comments:

**Background Information**: Have the students provided a ‘state-of-the-art’ description of their problem? Are they aware of what information is available? Do they have a understanding of the technical issues involved with their work? (maximum of 30 points) __________

Comments:

**Approach**: Have the students identified a reasonable approach to meet their goals and objectives that considers the background information? (maximum of 15 points) __________

Comments:

**Preliminary Work**: Consider the quality of the work performed to date. Are the students making reasonable progress? (maximum of 15 points) __________

Comments:

**Detailed Work Plan**: Have the students developed a reasonable plan to accomplish their goals and objectives next semester, including specific tasks and reasonable timelines? (maximum 25 points) __________

Comments:

(Final questions on reverse side)

Total Points
The following rubric will be used by MSE faculty and industrial sponsors in their evaluations of design teams during the final poster presentations.

<table>
<thead>
<tr>
<th></th>
<th>Unsatisfactory 1</th>
<th>Developing 2</th>
<th>Satisfactory 3</th>
<th>Outstanding 4</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Broad consideration of relevant properties</strong></td>
<td>Cannot identify any material properties related to design problem</td>
<td>Can identify some critical properties, but also focused on properties not related to design problem</td>
<td>Can identify most material properties relevant to design problem</td>
<td>Can identify all material properties most relevant to design problem</td>
<td></td>
</tr>
<tr>
<td><strong>Specific knowledge of properties</strong></td>
<td>Shows no understanding of critical materials properties</td>
<td>Shows some understanding of some of the critical materials properties</td>
<td>Shows good understanding of most of the critical materials properties</td>
<td>Shows deep understanding of all critical materials properties</td>
<td></td>
</tr>
<tr>
<td><strong>Appropriate materials or processes</strong></td>
<td>Cannot identify a specific material or process appropriate for the design problem</td>
<td>Can identify a single material or a simple process appropriate for the design problem</td>
<td>Can identify several materials or more detailed processes that are appropriate for the design problem</td>
<td>Describes the pros and cons of different materials or processes related to the design problem</td>
<td></td>
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</tbody>
</table>

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<tbody>
<tr>
<td><strong>Average Score</strong></td>
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</table>
Teammate Evaluation Rubric: Submit to coordinator **no later than 10/30/15 AND 12/4/15**

Your Name: __________________________  Teammate’s Name: __________________________

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<th></th>
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<th>Outstanding 4</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research &amp; Gather Information</strong></td>
<td>Does not collect any information that relates to the topic</td>
<td>Collects very little information- some relates to the topic</td>
<td>Collects some basic information- most relates to the topic</td>
<td>Collects a great deal of information- all relates to the topic</td>
<td></td>
</tr>
<tr>
<td><strong>Fulfill Team Roles &amp; Duties</strong></td>
<td>Does not perform any duties of assigned team roles</td>
<td>Performs very little duties</td>
<td>Performs nearly all duties</td>
<td>Performs all duties of the assigned team roles</td>
<td></td>
</tr>
<tr>
<td><strong>Shares equally</strong></td>
<td>Always relies on others to do work</td>
<td>Rarely does the assigned work- often needs reminding</td>
<td>Usually does the assigned work- rarely needs reminding</td>
<td>Always does the assigned work without having to be reminded</td>
<td></td>
</tr>
<tr>
<td><strong>Listens to other teammates</strong></td>
<td>Is always talking- never allows anyone else to speak</td>
<td>Usually doing most of the talking- rarely allows others to speak</td>
<td>Listens, but sometimes talks too much</td>
<td>Listens and speaks a fair amount</td>
<td></td>
</tr>
<tr>
<td><strong>Average Score</strong></td>
<td></td>
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