MEC E 464 – Design for Manufacture
Fall Term, 2011

Instructors:  
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Hours:  1-2s-4, or in practice, approximately eight hours per week:

1 h / wk Lecture (8 weeks)
2 h / wk Seminar (13 weeks)
6.5 h / wk Laboratory (8 weeks)

86 hours total in 13 weeks

Final Exam:  final exam is done in two parts:

▪ part one (race) will be on Saturday, 3 December 2011 at noon; location TBA
▪ part two (presentation) will be on the last day of class, Tuesday 6 December 2011 at 2:00 p.m.

the scheduled final exam time will be used to return your vehicles and equipment

Fees:  Fee Index 2 ($86.28 x 2 = $172.56)
Cost-recovery fee $1425

Facilities:  
Seminar Classroom  MEC 4-1  Tuesday  1400-1550
Manufacturing Lab  NAIT N119  Saturday  0800-1600
Metrology Laboratory  MEC 1-10  Monday-Friday  0800-1630
UEMS  MEC 1-25  Monday-Friday  0800-1630
Work Space - MecE 260 Benches  TBA
1. **Course Description and General Objectives**

Traditional engineering design education introduces students to the early steps of the design process, emphasizing conceptual exploration, concept evaluation and selection, and the detailed analysis and documentation of the selected design.

However, traditional design education is “open-loop”: it does not allow the student to manufacture and test the design, so the student does not learn whether the design will actually meet the original specifications. Therefore, the traditional approach does not develop a student’s judgement to make sound design decisions.

This course seeks to overcome this limitation by expanding upon traditional design education, extending the students’ experience to include manufacture and evaluation of their designs. By closing the design loop, students will experience the consequences of their design decisions, and a foundation of better judgement will be laid to help launch their careers.

Some specific objectives of this course include the following:

a. close the loop on the design process by extending the traditional engineering design education to include manufacturing, inspection, and functional evaluation of completed designs
b. design components within the context of an assembly
c. apply knowledge of the capabilities and limitations of manufacturing processes to the design process
d. provide students with experience manufacturing, assembling, and testing machine components and assemblies

2. **Prerequisites**

Prerequisites: MEC E 260 (Mechanical Design I)
MEC E 265 (Engineering Graphics and CAD)

Co-requisites: MEC E 301 (Mechanical Engineering Laboratory I)

3. **Major Topics**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Description</th>
<th>Approximate Time</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>introduction to design for manufacture</td>
<td>4 h</td>
</tr>
<tr>
<td>2</td>
<td>introduction to reverse engineering</td>
<td>1 h 10 h 1 h 12 h</td>
</tr>
<tr>
<td>3</td>
<td>introduction to machine shop practice</td>
<td>1 h 2 h 3 h</td>
</tr>
<tr>
<td>4</td>
<td>traditional material-removal processes</td>
<td>8 h 46 h 54 h</td>
</tr>
<tr>
<td>5</td>
<td>non-traditional material-removal processes</td>
<td>1 h 1 h 2 h</td>
</tr>
<tr>
<td>6</td>
<td>product evaluation</td>
<td>3 h</td>
</tr>
<tr>
<td>7</td>
<td>student presentations</td>
<td>8 h</td>
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<tr>
<td></td>
<td><strong>Sub-Totals</strong></td>
<td><strong>10 h 26 h 50 h 86 h</strong></td>
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</tbody>
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4. **Delivery Method**

This course is delivered with seminars, lectures, and laboratories:

- seminars will present theory of reverse engineering and design for manufacture, and be used to design project components and assemblies
- lectures will introduce machine tool theory and practices
- laboratories will involve the use of machine tools and metrology equipment to manufacture and assemble designs

5. **Student Evaluation**

A 50% minimum grade is required to achieve course credit. The final course grade will be calculated using the following weighting:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weighting</th>
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</thead>
<tbody>
<tr>
<td>Assignments and Laboratories</td>
<td>40 %</td>
</tr>
<tr>
<td>Project Vehicle Performance</td>
<td>30 %</td>
</tr>
<tr>
<td>Final Presentation</td>
<td>25 %</td>
</tr>
<tr>
<td>Restore Equipment to Original Condition</td>
<td>5%</td>
</tr>
</tbody>
</table>

6. **Texts and References**

**Recommended Text:**


Additional materials will be posted on eClass.

**References:**

The University of Alberta library holds an extensive collection of references related to product design and manufacturing, including books and videos. The following titles are available on-line through the UofA library web site, or are held in the library collections:


7. **Student Equipment & Supplies**

- lab coat, coveralls, or other suitable shop clothing
- approved safety glasses (CSA Z94.3 or ANSI Z87.1)
- approved safety shoes or boots (CSA green triangle)

8. **Assignments**

There will be several assignments during the course, including, but not limited to, the following subjects:

- engineering analysis
- design drawings
- drawing critique
- geometric dimensioning and tolerancing
- part inspection
- team presentations

**Late Policy**

Assignments are due on the date and time specified on the assignment sheet. Late assignments will be accepted, but any marks awarded will be subject to a 10% discount for each day late.

9. **Examinations**

There will not be a mid-term exam for this course.

The final exam will be done in two parts:

- **Part One**, to be held on the afternoon of Saturday, December 3rd, will be a race of all the team’s vehicles incorporating the new electric propulsion system. The race will be done in several heats, with the grading based on the number of laps each vehicle completes, and the number of student-made parts carried aboard the vehicle. The grading formulae will be presented at a later date. Part One will carry 20% of your overall course grade.
- **Part Two**, to be held during the last seminar period on Tuesday, December 6th, will be a team presentation on the design, manufacturing, inspection, and performance of the electric propulsion system, and the team’s experiences with the course. Part Two will carry 25% of your overall course grade.
**Academic & Professional Integrity**

Mechanical engineering students are expected to conduct themselves in accordance with University Policy Guidelines as well as the APEGGA Code of Ethics.

**COOPERATIVE & COLLABORATIVE WORK**

MecE 464 is a collaborative project course and students are expected and encouraged to cooperate and share information within their own team. Design teams may cooperate to develop, conduct and share experimental data where two teams are working on the same design project. However, copying another team’s design analysis, reduced data, calculations, drawings, illustrations, tables, charts, and reports without proper attribution is not acceptable engineering practice.

**UNIVERSITY POLICY GUIDELINES**

Policy about course outlines can be found in 23.4(2) of the University Calendar:

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.ualberta.ca/secretariat/appeals.htm) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University. (GFC 29 SEP 2003)

**APEGGA GUIDELINES**

**CODE OF ETHICS** (established pursuant to section 19(1)(j) of the Engineering, Geological and Geophysical Professions Act)

**Preamble**

Professional engineers, geologists and geophysicists shall recognize that professional ethics is founded upon integrity, competence, dignity and devotion to service. This concept shall guide their conduct at all times.

**Rules of Conduct**

1. Professional engineers, geologists and geophysicists shall, in their areas of practice, hold paramount the health, safety and welfare of the public and have regard for the environment.
2. Professional engineers, geologists and geophysicists shall undertake only work that they are competent to perform by virtue of their training and experience.
3. Professional engineers, geologists and geophysicists shall conduct themselves with integrity, honesty, fairness and objectivity in their professional activities.
4. Professional engineers, geologists and geophysicists shall comply with applicable statutes, regulations and bylaws in their professional practices.
5. Professional engineers, geologists and geophysicists shall uphold and enhance the honour, dignity and reputation of their professions and thus the ability of the professions to serve the public interest