EE491

Engineering Design/Analysis

A Special Inter-Disciplinary Class for Senior Electrical Engineering Students on Innovation and Entrepreneurship

Spring Semester 2014

UNIVERSITY
Of NEVADA
Reno

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EE491

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EE 491  Engineering Design/Analysis

Spring Semester 2014 Catalog Data

About EE 491:  Engineering Design/Analysis, 4 Credits
Invention, innovation, entrepreneurship, and design of products. Proposal writing, design, and fabrication procedures used by industry. This is major Capstone Course. Prerequisites: ENG 102, CH201 or 202 or 203, EE221, 320R, 490. Junior or senior standing.

Time/Location:  MWF 11:00-11:50 / MS 215
               Friday  1:00-5:00 / SEM 341

Text Books (recommended):


Objectives and Outcomes:

Student Learning Outcomes (ABET):  a, b, c, d, e, f, g, h, i, k

a. Students will be able to apply knowledge of mathematics, science, and engineering.
   •  Students will prepare a design plan using knowledge of mathematics, science, and engineering. The design plan will be evaluated.

b. Students will be able to design and conduct experiments, as well as to analyze and interpret data.
   •  Students will develop an electrical engineering products and test its functions and analyze the data from the test. The progress reports will be evaluated.

c. Students will be able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
   •  Students will design the electrical engineering products to meet economic or commercial need. Both business and design plans on the product will be
d. Students will be able to function on multidisciplinary teams.
   • Students will form teams to conduct the multidisciplinary projects. The team work will be evaluated through group presentation and reports on business plan, design plan, progress, and final product.

e. Students will be able to identify, formulate, and solve engineering problems.
   • Students will develop the electrical engineering product in a team manner and will identify, formulate, and solve problems during the development. The team will report the engineering problems and solutions for developing the product through group presentation and reports on design plan, progress, and final product.

f. Students will be able to understand professional and ethical responsibility.
   [integrates CO12]
   • Students will demonstrate understanding of the ethical principles in the business plan development and product design processes. Students will demonstrate an ability to recognize, articulate, and apply ethical principles in both the development and design processes.

g. Students will be able to communicate effectively.
   • Students’ team will have oral presentation and submit writing report in all stages of the class including business plan, design plan, progress, and final product.

h. Students will be able to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
   • Students will design the electrical engineering products based on understanding of their product in a marketable and societal context. The business plan and design plan of product will be submitted and evaluated.

i. Students will be able to recognize the need for, and be able to engage in, life-long learning.
   • Students will present and report future work in business plan and final product. The future work includes recognition of the need for life-long learning and future plan in order to further develop the product.

k. Students will be able to use the techniques, skills, and modern engineering tools necessary for engineering practice.
   • Students will use software package like Matlab, C++ and hardware equipment including oscilloscope, dynamic system analyzer, data acquisition system, multimeter, sensors to conduct the project and calibrate the product. The step of using the techniques, software package, facilities will be orally presented and described in writing design plan, progress reports, and final reports.
Evaluation (tentative):

Presentations and reports: 40% * †
Attendance: 15% (individual attendance evaluation conducted by TA)
Lab performance: 20% (individual project performance evaluated by TA and instructor)
Final presentation and report: 25% * †

* Note that: in the evaluation, team member efforts evaluation, and personnel evaluation by the team leader are the part of the evaluation to help assessing individual learning outcome.

† Note that: Students will be graded including
(1) professional and ethical responsibility during business plan design and management, and building the business;
(2) engineering ethics and professional integrity during developing technical products, which related to their projects (business ideas and products) that are included in their (i) business plan, (ii) project reports, and (iii) oral presentations. This will be part of their final grade for the course.

This course satisfies Core Objective 12, Ethics: “Students will demonstrate understanding of the ethical principles in general or in application of specialized knowledge, results of research, creative expression, or design processes. Students will demonstrate an ability to recognize, articulate, and apply ethical principles in various academic, professional, social, or personal contexts.”

Grading Scale (tentative):

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>93-100</td>
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<tr>
<td>A-</td>
<td>88-92</td>
</tr>
<tr>
<td>B+</td>
<td>84-87</td>
</tr>
<tr>
<td>B</td>
<td>80-83</td>
</tr>
<tr>
<td>B-</td>
<td>75-79</td>
</tr>
<tr>
<td>C+</td>
<td>70-74</td>
</tr>
<tr>
<td>C</td>
<td>65-69</td>
</tr>
<tr>
<td>C-</td>
<td>61-64</td>
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<tr>
<td>D+</td>
<td>58-60</td>
</tr>
<tr>
<td>D</td>
<td>55-57</td>
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<tr>
<td>D-</td>
<td>50-54</td>
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<tr>
<td>F</td>
<td>&lt;50</td>
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Disability Statement:

Any student with a disability needing academic adjustments or accommodations is requested to speak with the Disability Resource Center (Thompson Building, Suite 101) as soon as possible to arrange for appropriate accommodations.

Academic Dishonesty Statement:

Any student found cheating in any presentation, report, prototype development, quiz, or exam, will fail the class besides standard UNR penalties. Detailed UNR policy can be found in http://www.unr.edu/student-conduct/policies/university-policies-and-guidelines/academic-standards/policy
Audio/video Recording Statement:

Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.

Late Submissions:

Late submission of report will have a deduction of 10% of the grade per late day, to a maximum of two late days for each submission. No material will be accepted after two days past the deadline. For example, an assignment that is 80 points will get 80*0.9=72 if it is one day late, 80*0.8=64 if it is two days late. For the special case, please contact me ASAP.

Summary and Schedule:

This is a very demanding and time-consuming class. The students must adhere to class rules and are expected to devote a significant amount of time for working on their projects. The students are expected to develop their engineering skills and to show rich engineering judgment, perseverance, and determination in solving the problems and completing their projects. The students are encouraged to be open-ended and creative. Completing the project and the technical report in all their details is a sine-qua-non condition for succeeding in this class.

The students are separated into companies with no more than 5 persons in each group, called companies. Each company will choose an ORIGINAL PROJECT and will build that product. The students in each company will be involved in project management, technical design and product manufacturing problems.

The company can earn a maximum of 10,000 points allocated as follows:

<table>
<thead>
<tr>
<th>Week</th>
<th>Task &amp; Schedule</th>
<th>Max. Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2,3,4,5</td>
<td>(1) Choose/generate the project, prepare written business plan and present to class.</td>
<td>2,000</td>
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<td></td>
<td>(2) Guest lectures on</td>
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<tr>
<td></td>
<td>• Invention, innovation, and entrepreneurship;</td>
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<td></td>
<td>• Business plan development;</td>
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<td>• Marketing and business strategy;</td>
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<td></td>
<td>• Professional and ethical responsibility during business plan design and management, and building the business;</td>
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<tr>
<td></td>
<td>• Intellectual property protection and agreements.</td>
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<tr>
<td>Time Period</td>
<td>Details</td>
<td>Duration</td>
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</tbody>
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| 6,7,8,9,10  | (1) Order materials/parts, evaluation kits, breadboard system. Consider design problems and solutions, and packaging of final product. Submit progress reports 1, 2.  
(2) Guest lectures on  
- Engineering ethics and professional integrity during developing technical products;  
- Transforming idea to a product. | 3,000 |
| 11,12,13    | (1) Breadboard/test-bed complete, finish prototype/product, and prototype evaluation.  
(2) Guest lectures on  
- Products and commercialization process;  
- Design specification;  
- Concepts of quality engineering;  
- Product testing standards. | 2,000 |
| 14,15,16    | (1) Complete project and come out prototype/product, prepare final report or paper. Present completed project to faculty, invited guests, and award committee. Attend final exam.  
(2) Guest lectures on  
- A survival guide for new enterprise;  
- Career and life-long learning;  
- How to start a technical company. | 3,000 |

**Total** | **10,000** |