Guidelines for Vanderbilt Senior Engineering Design Projects

An Informational Booklet for Prospective Industrial Sponsors

Vanderbilt University School of Engineering

Nashville, TN

August 2010
Dear Prospective Project Sponsor,

Senior design courses provide students experience with real-world projects that involve budgets, reviews and deadlines. Students learn about the principles of design, professionalism, licensing, ethics affecting engineering decisions, entrepreneurship and the day-to-day implications of intellectual property. Students also gain experience in project management, develop team-based designing skills and become proficient in oral and written communication.

A project can be conducted by a team of students from the same department or a team of students from multiple departments. The capstone courses allow students to think about engineering design in an interdisciplinary way and provide a union from which interdisciplinary activities can evolve. This allows students an opportunity to experience the kind of multidisciplinary teamwork that they are likely to encounter in industry.

As their projects take form, student teams keep in touch with their industry and faculty advisors, hold meetings, write formal documentation and make presentations on their work. By the end of the academic year, the teams produce a prototype or virtual demonstration of their solution.

The School of Engineering recognizes the value of senior projects sponsored by industry and invites project sponsors— industry representatives, research and clinical faculty, and entrepreneurs—to submit project proposals. This provides meaningful projects of value to the sponsor, and it instills a professional orientation in the student team. If you or your company is interested in sponsoring a project or to learn more, please contact Prof. Paul King, who will coordinate with the relevant design instructor(s) in the discipline(s) most relevant to your project:

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Vanderbilt University
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paul.h.king@vanderbilt.edu

Please read the following pages for details about confidentiality, non-disclosure, intellectual property, and the expectations of a senior design project sponsor. Also, while every department scores their projects differently, an example of one department’s evaluation rubric is attached.

Sincerely,

Kenneth F. Galloway, Ph.D.
Dean of the School of Engineering
Specific Guidelines

1. The project should solve a specific need of the client.
2. Projects should involve design, modeling and analytical requirements.
3. Project deliverables should include tangible evidence of a successful design process, with the acceptable form of that evidence depending on the academic major. Generally, a physical prototype, manufacturing process, or hardware or software product is required. Specific examples include:
   a. Physical prototype for a new product or product advancement including associated manufacturing processes.
   b. Redesign of an existing product including a physical prototype and associated manufacturing process modifications.
   c. Physical prototype for new or redesigned test equipment or manufacturing process.
   d. Generation or improvement of a database and user interface.
   e. Analysis of a flow process (clinical, manufacturing process, etc.).
4. Projects are identified and posted for student selection beginning in August of each year.
5. Projects should not be time critical as client should assume a project cycle of two academic semesters, ending with Design Day presentations in late April of each year.
6. Project scope should be 1,000 to 1,200 engineering hours (250-300 hours for 4 students) distributed over the two semester period.
7. Students organize themselves into teams of three to five and then select their project by the middle of October. Thus,
   a. the client works with a team that is motivated and interested in the client’s project, and
   b. some projects may not be selected.
8. Teams will be mentored by experienced engineering faculty who provide guidance and evaluation and coordinate use of Vanderbilt equipment and/or facilities.
9. Client must be willing to dedicate time of a liaison engineer to the project (approximately 1 hr/week). Liaison engineer should:
   a. Have management support.
   b. Have vested interest in the success of the project.
   c. Be willing to work with students.
10. Modest funding and materials can be provided by the departments for the projects. If the project requires more extensive resources, the client and the design instructor must discuss this in advance and develop an agreement prior to posting the project.
11. Projects should not be classified or highly proprietary. Students and faculty will, if requested, sign a nondisclosure agreement.
12. Students should be able to publicly present their work with the mutual agreement of client. In the event a client wishes to avoid linkage with the work, their identity may be withheld.
13. In the case of an industry-sponsored project, the intellectual property is owned by the sponsoring company. For Vanderbilt-sponsored projects employing university facilities and/or personnel, the intellectual property is governed by Vanderbilt's intellectual property policies. More detail is available in the following pages.
14. Benefits to client include the opportunity to solve problems outside their own human resource capabilities as well as work with students, which can provide fresh problem solving approaches and recruiting opportunities.
15. VU benefits by expanding student horizons through early exposure to realistic business constraints.
16. Projects requiring interdisciplinary teams are strongly encouraged. Interdisciplinary teams from biomedical, electrical, computer, mechanical and chemical engineers may form. Civil engineering sponsors separate CE-focused projects, but does welcome students from other departments.
Vanderbilt University School of Engineering
“Senior Capstone Design Courses”

Explanation of Pre-Invention Assignment and Confidentiality Agreement

Attached is a Pre-Invention Assignment and Confidentiality Agreement that students will be asked to sign before they commence their Senior Capstone Design Courses sponsored by a host company. This Agreement is a legally binding document between the student and the company and is much like the commitments a student can expect to make when they enter industry.

The purpose of the Senior Capstone Design Courses is to allow students to work on a real-world engineering problem for a company involved in that industry. The Agreement will protect the interests of the company that participates in the Project so that they are not prejudiced in the event that either (i) intellectual property rights are created as a part of the Project or (ii) the company discloses to you confidential information that might injure its ability to compete if this confidential information became known to a competitor.

What is “intellectual property”? Intellectual property has been defined as any product of the human intellect that is unique, novel, and unobvious (and has some value in the marketplace). It can include: an idea, invention, expression or literary creation, unique name, business method, industrial process, chemical formula, computer program process, or presentation. In the Agreement, intellectual property is defined to include a wide variety of inventions and processes including: “inventions, improvements, methods, devices, software, know-how, trade secrets, discoveries and/or other technology, whether patentable or copyrightable or not, which are conceived and/or reduced to practice by Participant individually or jointly with other project Participants as a result of the project.”

So, what is it that the Agreement requires? Some specific points about the Agreement which should be borne in mind include the following:

The Agreement requires the student to assign (i.e., transfer) to the host company any intellectual property rights created as part of the Senior Capstone Design Courses or the enhancement or improvement of any existing intellectual property. It would also require students to sign documents to assist in the perfection of this assignment, including patent documents.

The principal objective of the Senior Capstone Design Courses is to further a student’s education by giving them some real-world experience working in industry.

The Agreement also requires the student to maintain in confidence any confidential information of the host company which is disclosed to them. Confidentiality provisions like this are quite common in industry and protect the reasonable expectations so the host company. Note that the host company is required, in the Agreement, to notify the student about which information is confidential.

The student should consider whether this Agreement would conflict with any other activity in which they are engaged. For example, if they are involved in a similar project as part of their teaching or research activities, they may want to consider whether the specific Senior Capstone Design Courses would create a real or perceived conflict with this other activity. Students may wish to discuss this with their professor.

Some obligations undertaken by you will continue in effect, in some instances, beyond the end of this academic year. For example, you may be asked to sign certain documents to perfect and protect the intellectual property rights related to the project in which you were engaged. The confidentiality obligation continues for a period of three years after the end of the Project. You should consider this serious obligation carefully.
IP Policy Acknowledgement Instructions

Projects can originate from either of two sources: Vanderbilt University, including the Medical Center, or outside industry. Depending on the project origin, different intellectual property policies will apply.

Vanderbilt Sponsored Projects. If a project is sponsored by Vanderbilt University, it is governed by the Vanderbilt policies on intellectual property. Student participation in this course requires that students read, be aware of, and agree with the Vanderbilt intellectual property policies. An acknowledgement that a student has read, and agreed with, these policies is attached.

Industry Sponsored Projects. If a project is sponsored by outside industry, the intellectual property generated as a result of the project becomes the property of the industrial sponsor, and is governed by the policies of the industrial sponsor. This policy has been documented and approved in a Memorandum of Understanding, dated October 24, 2003, from Chris McKinney to Ken Galloway and Nick Zeppos, which is available for your review. A student’s participation in this course requires that they read, be aware of, and agree with the intellectual property policies for industry sponsored projects.

Industry Non-Disclosure Agreements. In addition to intellectual property ownership, some projects may require non-disclosure agreements, which are managed separately by the project sponsor for each project. These types of agreements must be reviewed, acknowledged, and signed by the student on a case-by-case basis for each project. Students are required to consult with their professor BEFORE signing any non-disclosure agreements. The non-disclosure agreement must allow students to present their work to the class, post this work on the class web sites, and present the work at design day.
Intellectual Property and Senior Design Projects

If, while conducting a project, you use Vanderbilt resources (including funds, facilities, laboratories, or personnel), any intellectual property generated will be governed by the University’s “Policy on Technology and Literary and Artistic Works”. This Policy may be found in the Vanderbilt Faculty Manual, pages 84-90, and may be accessed via the on-line Student Handbook, Chapter 5, at http://www.vanderbilt.edu/student_handbook/sh091026.pdf. This statement refers the reader to Part III, chapter 4 of the Faculty Manual Web site (http://www.vanderbilt.edu/facman/facman_final.pdf#III). The Policy, in brief, states that intellectual property, such as an invention or process improvement, generated in this course shall be assigned to and owned by Vanderbilt University if it is created “with the use of University facilities or funds administered by the University.” In return, students are entitled to a portion of the royalties generated as provided in the Policy.

Students must inform their faculty sponsor and the Vanderbilt Office of Technology Transfer and Enterprise Development (OTTED) if there are any other agreements which involve the intellectual property to be created. OTTED will, in turn, determine whether to pursue patent or intellectual property rights protection and if so determined, will obtain that protection. Income received as a result of exploiting this intellectual property will be shared with the inventor(s)/creator(s) in accordance with the Policy. If the University waives or elects not to pursue its intellectual property rights,” and assuming there are no other contractual rights with respect to the intellectual property, the inventors/creators will be offered the rights to the intellectual property.

Consistent with University Policy, if a project is supported by a non-Vanderbilt sponsor, such as a corporation, it is the student’s responsibility to become informed of the intellectual property policy of the sponsor and how it may impact the project. Advice regarding such agreements is available on request from the Vanderbilt Office of Technology Transfer and Enterprise Development (3-2430) or the Office of the General Counsel (2-8613). It is further the student’s responsibility to inquire about and notify the instructor of any matters (such as confidentiality or other intellectual property issues) that would preclude such things as a web site posting or other public disclosure of progress reports. An agreement, continued for this school year, may be found in this booklet. This policy gives sponsors return for their giving projects to this course.

BME, ChBE, EE, CompE and ME engineering senior design project participants are required to discuss intellectual property issues as they formulate their project proposal in consultation with the corporate representative for the specific project. Project proposals that fail to identify and describe intellectual property issues will be considered unsuitable to satisfy course requirements. It is strongly recommended that you discuss intellectual property issues of your project with your Professor well before submission of your project proposal.

One important aspect in development of intellectual property is the “trail of evidence” created by contemporaneous laboratory notebooks which are required to be maintained by all project members. Final project reports that fail to include laboratory notebooks will be returned to the authors without assignment of grades.
By my signature below, I acknowledge that I am aware of Vanderbilt’s intellectual property Policy and that I have received a copy of the document I am signing.

_____________________                                                      ________________
Signature                                                                                  Date

_____________________
Name (printed)
1. **Parties**
This Agreement ("Agreement") is effective ________________________________ ("Effective Date") and is entered into by and between____________________________________________ (“Company”) and ___________________________________________________ (“Participant”) for the purpose of assigning ownership of copyrights and inventions resulting from project work in the course and providing for the confidentiality of certain information disclosed by the Company.

2. **Background**
Participant is either a student or a Vanderbilt University faculty member involved in the Vanderbilt University School of Engineering “Senior Capstone Design Courses.” As part of the aforementioned courses, Participant desires to work on a project consisting of one or more actual problems concerning design, manufacturing or other product development issues arising in connection with the business of Company (“Project”, as more fully described in Exhibit A, attached and made a part of this Agreement). The time period of the Project (“Project Period”) is the length of the academic year in which the course is offered.

3. **Invention Rights**
All inventions, improvements, methods, devices, software, know-how, trade secrets, discoveries and/or other technology, whether patentable or copyrightable or not, which are conceived and/or reduced to practice by Participant individually or jointly with other project Participants as a result of the project shall be referred to as “Project Developments”. All Project Developments shall belong exclusively to the Company. Participant agrees to assign (and hereby assigns) to Company all his/her rights, title and interest in Project Developments. Participant shall promptly and fully inform Company in writing of such Project Developments. Participant agrees to execute all papers and perform all other acts reasonably necessary to assist Company to perfect Company’s rights in Project Developments, e.g., to review and sign patent applications and execute additional invention or patent assignment documents and to cooperate with copyright registrations and execute additional assignment documents for copyrightable Project Developments.

4. **Confidentiality Provisions**
Company may disclose confidential and proprietary trade secret information to Participant. The parties mutually agree to enter into a confidential relationship with respect to the disclosure of certain proprietary and confidential information (“Confidential Information”).

A. **Definition of Confidential Information (Written or Oral)**
For purposes of this Agreement, “Confidential Information” shall include (i) all information or material that has been disclosed to Participant by Company during the Project Period and as identified as confidential by the Company and (ii) the Project Developments. In the event that Confidential Information is in written form, Company shall label or stamp the materials with the word “Confidential”
or some similar warning. In the event that Confidential Material is transmitted orally, the Company shall promptly provide a writing indicating that such oral communication constituted Confidential Information.

**B. Exclusions from Confidential Information**

Participant’s obligations under this Agreement shall not extend to information that is: (a) publicly known at the time of disclosure under this Agreement or subsequently becomes publicly known through no fault of the Participant; (b) discovered or created by Participant prior to the time of disclosure by Company; or (c) otherwise learned by the Participant through legitimate means other than from the Company or anyone connected with the Company.

**C. Obligations of Participant**

The Participant shall hold and maintain the Confidential Information of the Company in the strictest confidence for the sole and exclusive benefit of the Company. The Participant shall carefully restrict access to such Confidential Information to persons bound by this Agreement. The Participant shall not, without prior written approval of the Company, use for Participant’s own benefit, publish, copy, or otherwise disclose to others any of the Confidential Information. The Participant shall return to Company any and all records, notes, and other written, printed, or tangible materials in his or her possession pertaining to the Confidential Information and provided by Company immediately on the written request of the Company.

**5. General Provisions**

The term of this Agreement shall be from Effective Date specified to the end of Project Period with the exception that the confidentiality provisions in Section 4 of the Agreement shall survive the termination of any relationship between the Company and the Participant for a period of 3 years. The parties do not intend that any agency or partnership relationship be created between them by this Agreement. This Agreement may not be amended except in a writing signed by both parties. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Tennessee. This Agreement expresses the complete understanding of the parties with respect to the subject matter and supersedes all prior proposals, agreements, representations and understandings.

**COMPANY**

________________________________________________________________________
Signature

________________________________________________________________________
Name (print)

________________________________________________________________________
Title (print)

________________________________________________________________________
Date:

**PARTICIPANT**

________________________________________________________________________
Signature

________________________________________________________________________
Name (print)

________________________________________________________________________
Position (print)

________________________________________________________________________
Date:
# Scoring Sheet for Senior Design Project Posters and Papers

Items in Red are Mandatory. Please give a numeric grade on each of the six major areas. Please circle your estimates on the sub-areas.

**Project team name:** ______________________________________________

<table>
<thead>
<tr>
<th>1</th>
<th><strong>Engineering goals</strong></th>
<th>__/20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Problem Statement:</strong> clear problem definition (identify constraints &amp; alternatives), definition based on customer requirements (demands &amp; wishes)</td>
<td>F E E E+</td>
<td></td>
</tr>
<tr>
<td><strong>Prototype, test and/or prediction of performance:</strong> manufacturability; proof of concept; prototype can be a database which is established or revised.</td>
<td>F E E E+</td>
<td></td>
</tr>
<tr>
<td><strong>Documentation of problem solution:</strong> feasibility analyses (if no prototype); validation and verification (meets customer demands and industry standards)</td>
<td>F E E E+</td>
<td></td>
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<tr>
<td><strong>Safety, Health &amp; Risk Analysis:</strong> safety &amp; risk analysis; demonstration of appropriate mathematical analyses; environmental impact</td>
<td>na E E E+</td>
<td></td>
</tr>
<tr>
<td><strong>Economic/market consideration:</strong> Can it be made? Can people afford it? What is the number of potential users? Mathematical analyses if necessary. Market survey?</td>
<td>na E E E+</td>
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<tr>
<th>2</th>
<th><strong>Creative ability</strong></th>
<th>__/20</th>
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<tbody>
<tr>
<td><strong>Approach:</strong> logical analysis, consideration of alternatives; example of generation of ideas, ideation and innovation</td>
<td>F E E E+</td>
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<tr>
<td><strong>Originality:</strong> new, non-obvious, a contribution to the body of engineering knowledge;</td>
<td>na E E E+</td>
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<th>3</th>
<th><strong>Thoroughness</strong></th>
<th>__/20</th>
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<tbody>
<tr>
<td><strong>Documentation of effort:</strong> e.g., project notebook; Innovation Work Bench; Design file, etc.</td>
<td>F E E E+</td>
<td></td>
</tr>
<tr>
<td><strong>Literature review &amp; Patent search, References:</strong> primary sources; patents…</td>
<td>F E E E+</td>
<td></td>
</tr>
<tr>
<td><strong>Application of Standards</strong> (if applicable): relevant standards cited, e.g., FDA,, ISO, etc.</td>
<td>na E E E+</td>
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<tr>
<th>4</th>
<th><strong>Overall Competence in Design</strong></th>
<th>__/25</th>
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<tbody>
<tr>
<td><strong>Proper application of modern engineering techniques, skills and tools to problem</strong></td>
<td>F E E E+</td>
<td></td>
</tr>
<tr>
<td><strong>Demonstrated ability to design system, component or process</strong></td>
<td>F E E E+</td>
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<tr>
<td><strong>Problem scope:</strong> Design difficulty (e.g., open- v. closed-ended problem), magnitude of design challenge; is the problem trivial or not?</td>
<td>na E E E+</td>
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<tr>
<th>5</th>
<th><strong>Clarity of presentation</strong></th>
<th>__/10</th>
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<tbody>
<tr>
<td><strong>Engineering layout:</strong> easy to read, mix of text and pictures</td>
<td>F E E E+</td>
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<tr>
<td><strong>Well-written:</strong> is it a stand alone summary? Convincing evidence of solution’s quality; links findings to project statement?</td>
<td>F E E E+</td>
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<tr>
<td><strong>Overall impact:</strong> overall communication; convincing that this is a good solution</td>
<td>F E E E+</td>
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<tr>
<td><strong>Evidence of teamwork:</strong> can the evaluator have a substantive exchange about the project with each team member?</td>
<td>na E E E+</td>
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<th>6</th>
<th><strong>Ethical/Societal/Political considerations:</strong></th>
<th>__/5</th>
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<tbody>
<tr>
<td><strong>Ethical/Societal/Political considerations:</strong> Is anyone being excluded? Ethical treatment of subjects (human and animal)?</td>
<td>F E E E+</td>
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*F* indicates failure (< 60%), *na* indicates not applicable, *E* indicates performance below expectations (< 80%), *E* at expectations (85 +/- 5%), *E+* above expectations (95 +/- 5%)

**Judge name:** ______________________________

Nomination for design award? Circle one: Yes  No