Catalog Description

Critical analysis of issues at the intersection of engineering, philanthropy and social change. How engineering design, products and processes have impacted social change in the past and will do so in the future. Topics covered include energy, sustainability and climate change, autonomy, the digital future, low cost engineering, manufacturing, ethics and the impact of electronics on society. Faculty and external experts will engage with students on these and other topics of current interest in engineering and social change. Students will award a significant amount of grant money to an organization involved in technology for social change.

Course Vision

To inculcate an appreciation of the social change that Engineering creates, and how not only non-profit organizations and philanthropy but also for-profit enterprises act as catalysts. Students will appreciate that there is more to engineering than just “engineering” and be inspired to use their skills and mindset to practice social entrepreneurship and pursue ideas that make a difference.

Course Introduction

We are facing growing social and environmental challenges in our world where the solutions are not profitable financially but create significant social benefit and change. We must therefore create an environment where engineers have not only a social awareness, but also the skills and knowledge to build, work in and/or direct organizations where maximizing profits will also include maximizing worker, society and environmental benefits.

There are many examples of organizations involved in engineering, social change and philanthropy. Engineering for Change (E4C) and Engineers Without Borders (EWB) are good examples of nonprofit organizations directly involved in allowing engineers to use their skills in philanthropic ways. There are many major corporations including Palantir, General Electric, Alcoa, Google, and many others who are quite active in philanthropic work and have significant budgets to support these activities. Organizations such as the Gates Foundation utilize engineers with wide-ranging skillsets to take on significant global issues with aggressive goals, as do the U.N., RAND Corporation, the World Bank and others. There are an estimated 2.3 million operating nonprofits in the U.S., employing approximately 13.7M workers, which represents 10% of the nation’s workforce. Consequently, engineers have a significant role to play in this environment.

Many engineering students are already interested in and excited by the possibilities of putting their developing engineering skills to use in ways that benefit humanity without financial gain, and that interest will continue throughout their careers. In recognition of this, we are offering this course in which students will:

- Understand the interaction between engineering, social change and philanthropy, and how organizations engage in these activities.
- Articulate their view and philosophy of engineering as it creates social change.
- Practice leadership, teamwork, entrepreneurial skills and decision making by awarding a significant financial contribution to a nonprofit foundation.
- Practice the art of multi optimization in an environment with severe cost restraints to support underfunded projects of significant social value.

An integral part of this course is student participation. Students will be required to take part in impromptu group discussions, team exercises and decision-making not only in the classroom, but also outside. Students will engage with on-campus and external organizations and their representatives as part of the process of evaluation and grant-making, and at the end of the semester, the students will make formal presentations in support of an idea for social change they believe can be successful.
Course Components

The course is comprised of the following main components:

1. Engineering and Social Change Lectures

Students will hear lectures from associated faculty on issues of current interest in the area of Engineering and Social Change. Topics covered are at the intersection of engineering, technology and society and include autonomy, sustainability, energy efficiency, low cost engineering, design using crowdsourcing and the future of engineering among others. We will also include a series of guest speakers of significant reputation in their fields, such as those hosted from the Gates Foundation and USAID in previous semesters, and these speakers will vary each semester.

2. Philanthropy Lectures

Students will hear lectures from course partners that will define philanthropy as an exploration of how one develops a vision of the public good and then deploys resources (including donations, volunteers, and engineering/invention) to achieve an impact.

3. $10,000 Neilom Engineering for Social Change Grant

Students will go through the rewarding process of granting $10,000 to a local nonprofit organization of their choice to support a “theme” of their choice. An initial list of themes will be presented and the class will vote for one theme they wish to support and identify a number of nonprofit organizations operating within the theme of interest. Substantial information will be collected on these non-profit organizations (history, mission statement, measures of success, budget, infrastructure, etc.) and the class will learn basic budgeting information in order to assess proposals. The class will then prepare a mission statement and a request for proposals (RFP) that will go out to nonprofits identified as working within the theme area and consistent with the class goals as noted in the RFP. A number of nonprofits will respond with proposals, the students will review and rate all submitted proposals. The students will then participate actively in both phone interviews and site visits partially outside of class hours to selected nonprofit organizations. At the end of the course the class will decide through technical analysis, discussion and voting to grant $10,000 to one nonprofit due to a generous contribution from the Neilom Foundation, and on December 15th a final grant award ceremony will be held.

4. The Ideas for Social Change Challenge (ISCC)

The ISCC offers the students an opportunity to undertake an entrepreneurial approach to address a well-defined problem either in our local community or globally, utilizing knowledge they have gained about engineering, philanthropy and social change throughout the course. The students will work closely together in groups throughout the semester on their projects to give shape to their venture, and finally present their ISCC project at the end of the course, in addition to submitting a written project report.

For further details, see the ISCC - All You Need to Know package, which will be provided on Canvas.

5. Blog

Students are required to write a public blog posts on the class blog (see Canvas for details) at the end of the semester describing their point of view surrounding the ideas of engineering, social change and philanthropy, and how this course has changed, or impacted their view on engineering and social change.

6. Grant Ceremony
At the end of the semester students will be required to attend the grant ceremony, held on the same day as the scheduled day for a final exam for the class. During the grant ceremony the main grant award will be made to the successful nonprofit as chosen by the students, final ISCC presentations will also take place and there will be a final celebration of the activities of the course.

**Course Topics include:**

- Philanthropy for Engineers
- Motivations for Doing Good
- From Idea to Action
- Autonomy
- Social Impact of Cryptocurrency
- Innovation and Entrepreneurship
- Low Cost Engineering and Codesign
- How Science and Technology influences human behavior, and vice-versa
- Design using Crowdsourcing
- The Future of Engineering
- Energy and Policy from an international standpoint

**Student Learning Outcomes:**

As a result of taking this course students will have developed:

- A recognition of the need for the “soft skills” of engineering in conjunction with specific technical skills.
- An appreciation of the complexity of the development and sustainable implementation of engineering solutions in a societal context.
- A thorough understanding of the process of conducting a student-led grant competition as part of a large group, and the challenges involved in leveraging limited grant funds to evaluate and finally select the best organization to create maximum social change.
- The ability to design sustainable solutions to meet desired needs for a social problem affecting a specific community while also satisfying specific technical and non-technical constraints.
- The ability to function successfully in teams to deliver a well-developed solution to a societal problem.
- The ability to engage in effective discussion of both technical and non-technical issues in the overall process of making a successful and effective grant to an organization.
- An understanding of professional and ethical responsibility in philanthropic and technical decision-making.
- The ability to communicate solutions efficiently and effectively to an audience.
- An appreciation of the role for-profit and non-profit organizations as catalysts for social change.
- The ability to co-develop a mission and build an effective request for proposals as part of a group to identify organizations with viable ideas for using technology for social change.
- The skills required to evaluate projects through proposal review, leadership interviews and site visits.

**Number of credits**

3

**Prerequisites**

Academic Standing: Students with sufficient credit for junior standing and permission of the Mechanical Engineering Department.
Course duration

Fall 2015, September 1st to December 15th (date of final exam)

Class hours

Tuesdays and Thursdays 9:30 - 10:45 am, KEB Room 1200.

Technology Requirements

All students must come to class with an internet-connected device (phone, tablet or laptop) to perform voting tasks on during our philanthropy sections each week. We will be using Socrative.com for our anonymous class voting process – if you will use a mobile device for voting please make sure you have the free Socrative Student app available in the Apple or Google Play app stores.

Course Coordinators/Instructionrs

Professor Davinder K. Anand: Course Leader
Professor of Mechanical Engineering
Center for Engineering Concepts Development (CECD)
Department of Mechanical Engineering, A. James Clark School of Engineering
dkanand@umd.edu, 301-405-5294, Room 3120, Glenn L. Martin Hall.

Professor Balakumar Balachandran
Professor and Chair of Mechanical Engineering
Department of Mechanical Engineering, A. James Clark School of Engineering
balab@umd.edu, 301-405-4747, Room 2181, Glenn L. Martin Hall.

Professor Michael G. Pecht
Professor of Mechanical Engineering
Department of Mechanical Engineering, A. James Clark School of Engineering
pecht@umd.edu, 301-405-5323, Room S1103, Engineering Lab Building.

Mr. Dylan Hazelwood: Course Manager
Assistant Director
Center for Engineering Concepts Development (CECD)
Department of Mechanical Engineering, A. James Clark School of Engineering
dylan@umd.edu, 301-405-5434, Room 2142, Glenn L. Martin Hall.

Office Hours

Official office hours are in the Engineering for Social Change Lab, Room 2142, Glenn L. Martin Hall, Tuesday/Thursday at 2:00 - 4:00 pm. Other hours are by appointment; contact the Course Manager at dylan@umd.edu.

Textbook

The readings for the course are available through Canvas, or are freely available on the Internet. Case studies will be paid for and provided free of charge for students by the Center for Engineering Concepts Development (CECD) in the Department of Mechanical Engineering.

Course Website
Course announcements and all relevant information will be sent through Canvas, UMD’s learning management system.

**Course Elements and Grading**

<table>
<thead>
<tr>
<th>Course Element</th>
<th>Score</th>
<th>Assignment type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ideas for Social Change Challenge (ISCC)</td>
<td>30%</td>
<td>Group</td>
</tr>
<tr>
<td>Case Studies</td>
<td>10%</td>
<td>Individual</td>
</tr>
<tr>
<td>Proposal Review</td>
<td>10%</td>
<td>Individual</td>
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<tr>
<td>Midterm</td>
<td>15%</td>
<td>Individual</td>
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<tr>
<td>Engagement and Participation</td>
<td>20%</td>
<td>Individual/Group</td>
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<tr>
<td>Statement of Interest</td>
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<td>Individual</td>
</tr>
<tr>
<td>Blog</td>
<td>5%</td>
<td>Individual</td>
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<tr>
<td>Total</td>
<td>100%</td>
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</tr>
</tbody>
</table>

**Grading Process**

Grading for the course will be per University standards.

**Engineering for Social Change Lab (ESCL)**

The Engineering for Social Change lab is a meeting room and office in Room 2142 in Glenn L. Martin Hall where students are encouraged to stop by for informal/formal discussions on all aspects of the course throughout the semester. There will also be periods for the ISCC project where students will be required to visit for feedback on their project – please see the ISCC project documentation for details on Canvas.

**Exams**

There will be a midterm exam representing 15% of the total grade, and the final exam at the end of the semester is comprised of two parts: (i) a written report of the semester-long ISCC project, and (ii) a group presentation of the project during the grant ceremony at the end of the semester during the final exam period.

**Participation Grade**

Student participation is required as this is an interactive course with student choice-driven milestones and activities. We will record an engagement and participation grade during the semester comprising 20% of the final grade. Participation is comprised of classroom engagement and active discussion, as well as phone interviews and site visits with nonprofit organizations.

**Course Etiquette**

Attendance to both Tuesday and Thursday classes is expected. In lectures and discussions we expect students to listen and respond to their peers respectfully. We request that students to not use electronic devices unless relevant to the coursework or requested during the class period.

**Academic Integrity**

The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student, you are responsible for upholding these standards for this course. It is very
important for you to be aware of the consequences of cheating, fabrication, facilitation and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit: http://www.studenthonorcouncil.umd.edu/whatis.html.

Students are responsible for knowing, understanding, and behaving according to the content of the Code. There will be zero tolerance for any violations.

**Class Absences**

Students should contact the Course Manager, Mr. Dylan Hazelwood at dylan@umd.edu or 301-405-5434 to discuss make-up work or missed classes. Proper documentation is expected.

**Late Assignments**

Assignments are expected to be submitted by the due date listed on both Canvas and in the text of the assignment. Assignments submitted after the due date and time will incur a penalty of 5% of the total grade for the assignment per 24 hour period. If you have a medical emergency or other circumstances outside of your control and are unable to submit the assignment on time, contact the Course Manager at dylan@umd.edu.

**Students with learning and/or other disabilities:**

If you have a disability, please make an appointment with the Course Manager, Mr. Dylan Hazelwood at dylan@umd.edu or 301-405-5434 to discuss available accommodations to maximize your learning experience in this course. Learning disabilities must be documented by the Disability Support Services prior to receiving accommodations.

**Note:** *We strongly encourage the students to come prepared to class by looking into the specific topical area for the week in order to actively participate in class discussions. It is recommended that the students read the biographies and visit the websites of the speakers in order to achieve a better understanding for their respective field of expertise.*

**Important dates and deadlines**

Full schedule for all assignments will be given on Canvas. Dates may be subject to change, please verify on Canvas and with your instructor. Please see following page for the course schedule.
Course Schedule (subject to change):

<table>
<thead>
<tr>
<th>Week</th>
<th>Tuesday</th>
<th>Topic</th>
<th>Thursday</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-Sep</td>
<td>Prof. Anand - <em>Introduction to ESC</em></td>
<td>3-Sep</td>
<td>Prof. Grimm - <em>Philanthropy for Engineers</em></td>
</tr>
<tr>
<td>2</td>
<td>8-Sep</td>
<td>Dr. Kapilashrami - <em>Introduction to ISCC</em></td>
<td>10-Sep</td>
<td>Prof. Grimm - <em>Motivations for Doing Good</em></td>
</tr>
<tr>
<td>3</td>
<td>15-Sep</td>
<td>Guest speakers - <em>From Idea to Action: Ghedalia Gold Pastor, Jazmyne Claggett, Mukes Kapilashrami</em></td>
<td>17-Sep</td>
<td>Dr. Ryan Shelby - USAID</td>
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<tr>
<td>4</td>
<td>22-Sep</td>
<td>Dr. Littlefield and Mr. Hazelwood - <em>Grant Process, Mechanics of Voting</em></td>
<td>24-Sep</td>
<td>Dr. Littlefield and Mr. Hazelwood – <em>Grant Process, Initial Theme selection vote to final</em></td>
</tr>
<tr>
<td>5</td>
<td>29-Sep</td>
<td>Erica Estrada-Liou – <em>Innovation and Entrepreneurship</em></td>
<td>1-Oct</td>
<td>Dr. Kapilashrami - <em>ISCC group presentation: executive summary of the project.</em></td>
</tr>
<tr>
<td>6</td>
<td>6-Oct</td>
<td>Prof. Fuge - <em>Design via crowdsourcing</em></td>
<td>8-Oct</td>
<td>Dr. Littlefield and Mr. Hazelwood - <em>Grant Process: mission, budgets, RFP part 1</em></td>
</tr>
<tr>
<td>7</td>
<td>13-Oct</td>
<td>Prof. Pecht – <em>Does Science and Technology influence behavior, and vice-versa</em></td>
<td>15-Oct</td>
<td>Dr. Littlefield and Mr. Hazelwood - <em>Grant Process: RFP Part 2</em></td>
</tr>
<tr>
<td>8</td>
<td>20-Oct</td>
<td>Dr. Firebaugh – <em>Autonomy</em></td>
<td>22-Oct</td>
<td>Prof. Vaughn-Cooke – <em>Human Factors Engineering</em></td>
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<tr>
<td>9</td>
<td>27-Oct</td>
<td>Dr. Kapilashrami - <em>ISCC workshop</em></td>
<td>29-Oct</td>
<td>Andrew Miller – <em>Social Impact of Encrypted Currency</em></td>
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<tr>
<td>10</td>
<td>3-Nov</td>
<td>Dr. Littlefield and Mr. Hazelwood - <em>Grant Process: Voting for Phone Interviews and Preparation</em></td>
<td>5-Nov</td>
<td>Dr. Littlefield, Mr. Hazelwood - <em>Grant Process: Phone Interviews</em></td>
</tr>
<tr>
<td>11</td>
<td>10-Nov</td>
<td>Smeeta Hirani - <em>From Microsoft to Social Change</em></td>
<td>12-Nov</td>
<td>Dr. Littlefield and Mr. Hazelwood - <em>Grant Process: Voting for Site Visits and Preparation</em></td>
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<tr>
<td>12</td>
<td>17-Nov</td>
<td>Dr. Kapilashrami – <em>ISCC final draft presentations</em></td>
<td>19-Nov</td>
<td>Mr. Hazelwood and Dr. Kapilashrami - <em>Grant Process: site visits</em></td>
</tr>
<tr>
<td>13</td>
<td>24-Nov</td>
<td>Prof. Barton Forman – <em>Water and Sustainability</em></td>
<td>26-Nov</td>
<td><strong>No class - Thanksgiving</strong></td>
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<tr>
<td>14</td>
<td>1-Dec</td>
<td>Prof. Kim - <em>Future of Engineering</em></td>
<td>3-Dec</td>
<td>Prof. Gabriel - <em>Energy and Policy from an international Standpoint</em></td>
</tr>
<tr>
<td>15</td>
<td>8-Dec</td>
<td>Dr. Littlefield and Mr. Hazelwood - <em>Grant Process: final vote on nonprofit award</em></td>
<td>10-Dec</td>
<td>Prof. Anand + Group – <em>What Have We Learned?</em></td>
</tr>
</tbody>
</table>