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Design Project

ENGR 3030 (4 Credits / 60 hours)

Jordan: Engineering and Design for Sustainable Environments

This syllabus is representative of a typical semester. Because courses develop and change over time to take advantage of unique learning opportunities, actual course content varies from semester to semester.

Description
The scarcity of water, along with the lack of renewable energy, and other engineering challenges in the Middle East have long been a significant drivers of regional conflict and they continue to pose challenges to the region's growth, security, and long-term sustainability. Jordan, in particular, illustrates some of the biggest challenges faced by countries in the region. Considered to be the fourth-driest country in the world, Jordan faces increased water needs from climate change and a growing population including refugees. The Design Project aims to provide engineering students and students interested in human-centered design with a creative space to engage with resources and the competencies needed for the development of design project that will produce a prototype that addresses a local engineering problem. The focus is on innovative engineering responses at the grass-roots and community levels. In a field-study context, students interact with local engineers, community groups, businesses, and policymakers about emerging resilient practices and ideas for water shortage and supply, renewable energy, and food security. Students assess needs and develop human-centered engineering designs to existing problems. Student design teams, under the direction of a faculty advisor, will tackle real-world, open-ended design projects, learning to apply science and engineering knowledge to develop robust engineering solutions. Students will learn to meet realistic constraints including economics, manufacturability, sustainability, ethics, societal impacts, and safety.

Learning Outcomes
The *Design Project* course comprises 60 hours of instruction (4 credits). Upon completion of the course, students will be able to:
- Apply the engineering design process to a local community (client) identified problem;
- Identify and incorporate appropriate engineering standards in design;
- Manage an engineering project through the need assessment/research/design process cycle;
- Acquire skills in project management;
- Acquire skills in working in an international context with others as a member of a team;
- Acquire skills in oral project presentations.

Course Schedule
Students will be provided a detailed course schedule during orientation on the program. Please be aware that topics and excursions may vary to take advantage of any emerging events, to

accommodate changes in our lecturers' availability, and to respect any changes that would affect student safety. Students will be notified if this occurs.

Course Methodology
In order to accomplish the course learning outcomes, the students will:
1. Work in student teams on an industrially sponsored design project. This requires establishing leadership roles, creating a collaborative and inclusive environment, and planning and executing tasks to meet objectives. (ABET Student Outcome 5)
2. Define the problems/opportunities and generate engineering requirements for the solution. (ABET Student Outcome 1: identify and formulate complex problems)
3. Seek out and apply new knowledge in pursuit of a thorough understanding of the engineering problem. (ABET Student Outcome 7)
4. Complete detailed design and build and evaluate prototypes. (ABET Student Outcome 1: solve complex problems)
5. Present the intermediate design orally to the industrial sponsors and faculty (primarily technical audiences). (ABET Student Outcome 3)

Evaluation and Grading Criteria

Description of Assignments:

Reports (2) and Presentation (30%):
Report One: will be in week two of the program. There are two options for this report. *Option 1* is for students that are selecting a project; in this case, the report should include the project idea and justification of the choice of project. The paper should include a clear articulation of the connection between the chosen project and the theme of the program. *Option 2* is for students that have a pre-assigned project; in this case, the report should demonstrate a deep understanding of the community needs assessment that will guide the design process going forward. This should include a problem statement, deliverables list, detailed requirements list, and standards important for the project.

Report Two: (week four of the program). There are two options for this report. *Option 1* is for students that are selecting a project; it should include the draft design of the project and the community needs assessment with the expected outcomes. *Option 2* is for students that have a pre-assigned project; the report should describe the preliminary design, competing technologies, and lay out a plan for the remainder of the semester as well as a rough plan for the second semester back at your home institution.

Presentation: will be due in week 6. It should be 15 minutes long and include the preliminary design, community needs assessment, milestones of the plan going forward and expected outcomes. The academic director and fellow peer students will provide feedback on the design.

Final Design Project Paper (40%):
The final design project paper (15 – 20 pages). Assessment of the written project and the oral presentation is based on the accuracy of information conveyed, the student's methods and effectiveness of gathering information, organization, assimilation, the clarity of the presentation, the quality of analysis and argumentation, oral expression, clarity of answers to questions and civility of interaction. Also, assessment of the end product includes efficacy of design relative to the project goal and the quality of final project's outcome.

The paper should follow the following design:

1. Introduction: Title page, Acknowledgement, and Abstract
2. Community needs assessment and Methodology
    Explain the rationale for your choice in design projects (if applicable). Provide a brief description of the process and methods used to determine the needs of the client/local community.
3. Background research/ Literature Review/ Competing Technologies
    This segment is usually a general introduction into the literature and theories relevant to your topic. Link your topic to the literature currently available on the subject—cite authors, book titles, theories, or general perceptions that you may or may not agree with. Explain why you feel these authors were right or wrong; argue with or against their theories using your own observations or those of other theorists. Describe any related technologies and how they impact the design.
4. Findings/Results Description of the design project/Plan for Second Semester (if applicable)
    Provide a detailed description of the design project and prototype. Outline the resources needed to achieve the design project. Provide the financial resources needed for the implementation of the proposed project. Articulate what indicators will be used to measure the success of the project.
5. Ethical/moral and safety issues
    Provide an assessment of the key ethical/moral impacts of the project on local communities. Highlight any safety issues that could arise with your design.
6. Conclusion and recommendation
7. Bibliography/list of resources

Human Subjects Review
The design project proposal must reflect a thoughtful and culturally-appropriate consideration of the effects of the inquiry on the participants in the project, with an eye to the highest standards of academic scholarship. Any questions or concerns that cannot be resolved at the program level (through the Local Review Board) are forwarded to SIT's Institutional Review Board for review. The design project must reflect SIT's ethics policy and commitment to the values of reciprocity. The student should also abide by the value system of the local community including dress and behavior. Violations of SIT's code of conduct will result in an immediate termination of the collaboration with the client/local community and can lead to further disciplinary sanctions by SIT. Evaluation and Grading Criteria In addition to attending lectures, each student shall attend design team meetings, meet with the faculty advisor, work on individual and group written assignments, prepare short classroom presentations, assist their team in writing the final group report, and prepare and participate in the end-of-term Design Project group presentation.

Final Design Project Presentation (20%)
The Final Design Project Presentation should be approximately 25 minutes long and illustrate the various components of the final paper and final design (introduction, background research, community needs assessment, methodology, findings, description of the design project, ethical/safety considerations, and conclusion). The presentation must be accompanied by appropriate figures and additional data or methods information. Assessment will be based on innovation, clear articulation of major design concepts, detailed and thorough articulation of the project design and development, efficiency of the final design, quality of ethics and access considerations to local populations, and clarity of the information presented. The Academic Director will ask follow up questions at the end of the presentation.

<u>Participation and Attendance (10%)</u>
Attendance, punctuality, active involvement in discussions, and completion of reading assignments are mandatory.

<u>Assessment:</u>
Presentations and Reports	30%
Final Design Project Paper	40%
Final Design Project Presentation	20%
Participation and Attendance	10%

Grading Scale:
94-100% A Excellent
90-93% A-
87-89% B+
84-86% B Above Average
80-83% B-
77-79% C+
74-76% C Average
70-73% C-
67-69% D+
64-66% D Below Average
below 64 F Fail

Expectations and Policies

- <u>Show up prepared</u>. Be on time, have your readings completed and points in mind for discussion or clarification. Complying with these elements raises the level of class discussion for everyone.
- <u>Have assignments completed on schedule, printed, and done accordingly to the specified requirements</u>. This will help ensure that your assignments are returned in a timely manner.
- <u>Ask questions in class. Engage the lecturer</u>. These are often very busy professionals who are doing us an honor by coming to speak….
- <u>Comply with academic integrity policies</u> (no plagiarism or cheating, nothing unethical).
- <u>Respect differences of opinion </u>(classmates', lecturers, local constituents engaged with on the visits). You are not expected to agree with everything you hear, but you are expected to listen across difference and consider other perspectives with respect.

Please refer to the SIT Study Abroad Student Handbook for policies on academic integrity, ethics, warning and probation, diversity and disability, sexual harassment, and the academic appeals process.

Disability Services: Students with disabilities are encouraged to contact Disability Services at disabilityservices@sit.edu for information and support in facilitating an accessible educational experience. Additional information regarding SIT Disability Services, including a link to the online request form, can be found on the Disability Services website at http://studyabroad.sit.edu/disabilityservices.