Design and Innovation in the Social Domain

ENGR 3003 (3 Credits)

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
This course will be provided online prior to in-country arrival. It aims to provide engineering students and students interested in human-Action with the opportunity to study human-centered design methods and ethics in the context of Jordan. Students collaborate with local NGOs and community members to interview, research, assess needs, and identify a local engineering problem. While Jordan has been developing innovative approaches to water shortage, storage and supply, organic farming, food security, and sustainable energy production, the country still faces increased water needs from climate change and a growing population including refugees. Design and Innovation in the Social Domain seminar brings students and local communities together in collaborative and hands-on designs to identify an existing problem and engineer a concept idea that can be developed into a design project and eventually a prototype. Students will think through engineering solutions to existing problems in water and renewable energy in arid environments, food design or sustainable organic farming. The aim is for students to weave emergent thinking into a design innovation, prototype a solution when they are back at their school, and eventually share the solution with the community it was designed for.

Learning Outcomes
Upon completion of the course, students will be able to:

• Identify an existing engineering problem and formulate the problem into design goals;
• Develop the capacity to assess community needs in the context of Jordan and engineer possible solutions to existing problems;
• Analyze, compare, and evaluate alternative engineering designs to existing problems;
• Develop and assess concept selection in observance of local ethics and value systems;
• Process background research for an engineering concept design and delineate ethical standards for implementation;

Language of Instruction
This course is taught in English, but students will be exposed to vocabulary related to course content as well as the nuances of economic change and development through in-country expert lectures and field visits in a wide range of venues and regional locales.

**Course Schedule**
This course is provided online. Students will be provided a detailed course schedule during orientation on the course.

**Module 1: Human-Centered Design and Needs Assessment in the Context of Jordan**
This module introduces human-centered design and the goals of interaction in design selection and implementation. The module also focuses on the environmental challenges that Jordan face in terms of water, energy and agriculture. Students work with local community members to complete a needs assessment of community engineering challenges. Through this process students and community members collaborate on: identifying concerns, determining measurable indicators, gathering data to define needs, identifying and analyzing causes, and identifying possible solutions.

**Topics include:**
- Human-Centered Design: definition, approaches, and challenges
- Meeting with a local designer: Sahar Madanat (www.saharmadanat.com)
- Water resources and sustainability in Jordan
- Renewable energy opportunities in Jordan (small- and large-scale projects)
- Agriculture in Jordan and sustainable strategies
- Cultural Probes: qualitative contextual design research
- Ethnological methods
- Participatory Co-Design workshop
- Design ethnography

**Excursions (during January 2021):**
- Royal Botanic Garden (water resource management)
- King Talal Dam (the biggest Dam in Jordan, collects around 60 million cubic meters used in Agriculture)
- Wadi Araba and Jordan Valley (water justice and Agriculture)

**Required Readings:**

**Required Videos:**

**Recommended Readings:**

**Online Resources:**

**Module 2: Engineering Water in Jordan**
This module focuses on the innovative methods in the design, harvesting, and conservation of water in Jordan. The module combines lectures by experts and field visits to water innovation projects.

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Topics include:

- Rain harvesting system design and construction: pilot projects
- Water conservation and management in arid and semi-arid regions: Al-Azraq oasis project
- Low-cost eco-bio technological methods for the purification and reuse of domestic wastewater
- Water tank design

Excursions (during January 2021):

- Dana nature reserve
- Ancient water harvesting system (Petra)
- Wadi Rum community farmers (small scale farmers) and visit Disi project

Required Readings:


Recommended Readings:


Module 3: Human-Centered Design in the Context of Humanitarian Crisis
This module addresses the principles, rights, and duties governing humanitarian action as set out in the humanitarian charter. The module examines the major sectors of humanitarian response and investigates humanitarian innovation in each sector.

Topics include:

- Introduction to refugee humanitarian action
- Humanitarian innovation and water supply, sanitation, and hygiene
- Collaboration, intervention, and resilience in the context of displaced populations
• Human-centered design workshop: engineering practical solutions

Required Reading:

Module 4: The Ethics of Interaction with Vulnerable Populations
This module addresses the methodological and ethical challenges and considerations in social science research on vulnerable populations with special focus on refugees and displaced populations. The module explores the cultural and social norms that should be considered when interacting with or interviewing refugees.

Topics include:
• Methodological and ethical consideration of interaction with vulnerable populations
• Structured and semi-structured interviewing with rural populations
• Interacting with refugee populations
• Ethics and gender-related vulnerabilities

Required Readings:

Evaluation and Grading Criteria

Description of Assignments:

Cultural Probes assignments (25%): Cultural probes are used to gain insight into and inspirational responses about the daily life and habits of communities. Students are given probes along with tasks to allow them to record specific events, feelings, or interactions.

Background Research for Design Project (25%): Students complete background research on their engineering concept project design and delineate ethical standards for its implementation.
Human-centered Design exercises (40%):
Students will complete individual assignment to practice applying the various methods of human-centered design.

Participation (10%):
Students are expected to show up prepared for class, and having completed the appropriate readings, participate in class discussions, and carry out all assignments and other activities.

Assessment:
- Cultural Probes assignments 25%
- Background Research for Design Project 25%
- Human-Centered Design exercises 40%
- Participation 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
- **Show up prepared.** 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.
- **Have assignments completed on schedule, printed, and done accordingly to the specified requirements.** This will help ensure that your assignments are returned in a timely manner.
- **Ask questions in class. Engage the lecturer.** These are often very busy professionals who are doing us an honor by coming to speak….
- **Comply with academic integrity policies** (no plagiarism or cheating, nothing unethical).
- **Respect differences of opinion** (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.
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