SIT SCHOOL FOR INTERNATIONAL TRAINING STUDY ABROAD

SYLLABUS

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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 in-country during January 2021. 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. Students will be able to visit the sites and meet the partners that have been working with them on their design during Summer 2020.

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

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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
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:

- 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:

Quan, S. J. (2019). Smart Design for Sustainable Neighborhood Development. *Energy Procedia*, *158*, 6515-6520.

Export.Gov. (2018). Jordan – Agricultural Sectors. Retrieved from: https://www.export.gov/article?id=Jordan-Agricultural-Sectors

Van der Bijl-Brouwer, M., & Dorst, K. (2017). Advancing the strategic impact of human-centered design. *Design Studies*, *53*, 1-23.

Ceschin, F., & Gaziulusoy, I. (2016). Evolution of design for sustainability: From product design to design for system innovations and transitions. *Design Studies*, *47*, 118-163.

Giacomin, J. (2014). What Is Human Centered Design? *The Design Journal*, 17:4. Retrieved: http://hcdi.brunel.ac.uk/files/What%20is%20Human%20Centred%20Design.pdf

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Cary, J. (2013). What is Design, if Not Human Centered? *Stanford Social Innovation Review*.
Altz-Stamm, A. (2012). Jordan's water resource challenges and the prospects for sustainability. *GIS for Water Resources*.
Jordan Ministry of Agriculture. (2011). The Agricultural Sector in Jordan…Reality and Goals. Retrieved from:
http://moa.gov.jo/LinkClick.aspx?fileticket=IGjWN5Sx6aI%3D&tabid=570&mid=744&language=ar-JO

Required Videos:

Video: Qualitative Contextual Design Research. Accessed: https://www.thedesignexchange.org/design_methods/162
Video: What is Co-Design? Accessed: https://www.thedesignexchange.org/design_methods/129
Video: What is Ethnography? Accessed: https://www.thedesignexchange.org/design_methods/340

Recommended Readings:

Carey, M., White, E. J., McMahon, M., & O'Sullivan, L. W. (2019). Using personas to exploit environmental attitudes and behaviour in sustainable product design. *Applied Ergonomics*, *78*, 97-109.
USAID. (2019). Jordan Water Resources and Environment. Retrieved from: https://www.usaid.gov/jordan/water-and-wastewater-infrastructure
Ahmad, S., Wong, K. Y., Tseng, M. L., & Wong, W. P. (2018). Sustainable product design and development: A review of tools, applications and research prospects. *Resources, Conservation and Recycling*, *132*, 49-61.
Jamiya Project. (2016). Human-Centered Design within Human-Centered Design within … Retrieved: https://medium.com/@JamiyaProject/human-centered-design-within-human-centered-design-within-6ff7df47c4eb
Forlizzi, J. (2008). The product ecology: Understanding social product use and supporting design culture. *International Journal of design*, *2*(1).
Dourish, P. (2006). Implications for design. In *Proceedings of the SIGCHI conference on Human Factors in computing systems* (pp. 541-550). ACM.

Online Resources:

Needs assessment process. Retrieved: https://etc.usf.edu/broward/mod1/module1.html
Conducting assessment needs surveys. Retrieved: http://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/conducting-needs-assessment-surveys/main
Design Methods. Accessed: https://www.thedesignexchange.org/design_methods

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.

Topics include:

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- 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:

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

Required Readings:

Aljaradin, M., & Aboulila, T. S. (2011). Evaluation of using grey water as an alternative irrigation source in Jordan. *Vatten: tidskrift för vattenvård/Journal of Water Management and research*, *67*(2), 119-122.

Hadadin, N., Qaqish, M., Akawwi, E., & Bdour, A. (2010). Water shortage in Jordan—Sustainable solutions. *Desalination*, *250*(1), 197-202.

Jamrah, A., & Ayyash, S. (2008). Greywater generation and characterization in major cities in Jordan. *Jordan Journal of Civil Engineering*, *2*(4), 376-390.

Recommended Readings:

European Commission DG Environment News Alert Service. (2015). *Sustainable management of water in an arid region: water supply measures compared (continued)*. Retrieved from: http://ec.europa.eu/environment/integration/research/newsalert/pdf/sustainable_management_of_water_in_an_arid_region_413na5_en.pdf

The Inter-Islamic Network on Water Resources Development and Management. (2007). *Studies of IDRC Supported Research on Greywater in Jordan Conducted by INWRDAM.* Retrieved from: http://inwrdam.org.jo/wp-content/uploads/2018/07/INWRDAM-booklet-on-greywater-research-outcomes-2008-English-Version.pdf

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:

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Louise Bloom, Louise and Betts, Alexander (2013) The two worlds of humanitarian innovation. Working Papers Series NO. 94. Oxford: Refugee Studies Centre,

Pittaway, F, Bartolomei, L. Hugman, R. (2010). '"Stop Stealing Our Stories": The Ethics of Research with Vulnerable Groups." *Journal of Human Rights Practice*, 2(2):229-251.

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:

McKown, L. (2016). Applying Human-Centered Design to Refugee Challenges in Dadaab, Kenya. Retrieved: https://www.idin.org/blog-news-events/blog/applying-human-centered-design-refugee-challenges-dadaab-kenya

Block, K. (2013). Addressing Ethical and Methodological Challenges in Research with Refugee-background Young People: Reflections from the Field. *Journal of Refugee Studies* 26 (1): 69-87.

Voutira, E. and Dona, G. (2007). Refugee Research Methodologies: Consolidation and Transformation of a Field. *Journal of Refugee Studies*, 20(2):163-171.

Jacobsen, K. Landau, L.B. (2003). The Dual Imperative in Refugee Research: Some Methodological and Ethical Considerations in Social Science Research on Forced Migration. *Disasters,* 27(3):185.

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%):

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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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