Syllabus for CEE 498.
Engineering Jordan: Water in an Arid Land

Instructors

Dr. Heidi Gough, PE – lead UW instructor
University of Washington, Department of Civil and Environmental Engineering
More Hall Room 306 (room 319 – lab)
hgough@uw.edu; 206-541-0791 (UW office); 206-683-4748 (cell)

Dr. Muna Abu-Dalo – co-instructor and local coordinator
Jordan University for Science and Technology, Department of Applied Chemistry
maabudalo@just.edu.jo

Jaffer Alali – course TA, and Arabic language resource
University of Washington, Department of Civil and Environmental Engineering
alija0b@uw.edu

Course Description

Engineered water systems play a vital societal role through water and wastewater treatment to ensure public health and environmental protection. Climate and cultural attitudes toward water differ drastically around the globe, both of which impact the effectiveness of engineering water systems designs. This course examines impacts of a hot dry climate on water engineering systems by studying the engineered water cycle in Jordan including (Unit 1) Water Cycles and Water Sources in Jordan, (Unit 2) Drinking Water Treatment and distribution in Jordan including Desalination, (Unit 3) Wastewater Treatment and Reuse, (Unit 4) Decentralized and On-site Treatment, and (Unit 5) Ancient Water Engineering.

This course has been designed to provide students with the contextual engineering background to apply critical thinking skills to water engineering problems in an international context, including

- Apply engineering principals and equations to identify water resources and treatment plant operations that are affected by high ambient temperatures,
- Discuss cultural traditions and practices that impact water engineering in Jordan,
- Communicate science or engineering ideas in an oral presentation format,
- Sketch ancient water engineering systems and use modern engineering theories to postulate how ancient water units may have worked.

Required and Optional Activities

Attendance is mandatory at all academic activities, including field trips, guest lectures, instructor lectures, discussion groups, etc. *Optional activities* will be advertised as such and may include trips to local museums (not related to course content), trip to local markets, sporting events, or social gatherings. If it is unclear if an activity is optional, please ask Dr. Gough.

Course Schedule

Spring quarter:

- 1 hour per week during the spring quarter (10 contact hours + 3 hours of outside work), and
- 1 technical field trip from an approved list (minimum, equivalent to 2 hours of outside work)

Week 1: Introduction to international travel and expectations
Week 2: Jordanian Culture
Week 3: Introduction to Basic Arabic Phrases
Week 4: History of Jordan (including water engineering history)
Week 5: Reading and Discussing Scholarly Papers
Week 6: Overview of Student Project Assignments
Week 7: Intro to Water Systems in Jordan
Week 8: Intro to Drinking Water Treatment
Week 9: Intro to Wastewater Treatment
Week 10: Quiz 1

Technical Field Trips will be scheduled to best accommodate student schedules and will include:

- Cedar River Watershed (Unfiltered Source of Seattle Drinking Water)
- Tolt Water Treatment Facility (Coagulation and Filtration)
- Everett Water Treatment Facility (Coagulation and Filtration)
- Snoqualmie Wastewater Treatment Facility (Oxidation Ditch technology)
- West Point Wastewater Treatment Facility (Activated Sludge technology)
- Everett Wastewater Treatment Facility (Parallel Activated Sludge and Trickling Filter technologies)

Early Fall Quarter:

Date	**Course work/ Activity**
Friday Aug 23	Dr. Heidi Gough and Jaffer Alali leave Seattle
Saturday Aug 24	Dr. Heidi Gough and Jaffer Alali arrive at JUST campus
Week 1: Aug 25 – Aug 31	
Sunday	Instructor meeting at JUST (including JUST staff)
Monday	UW students arrive at JUST
Tuesday	JUST campus orientation and tour Lecture: Climate change and water resources, *Dr. Fayez Abdulla*
Wednesday	Technical tour: Azraq Wetland Oasis Cultural tour: Qasr ‘Amra
Thursday	Lecture: Introduction to Water Treatment, Dr. Muna Abu Dalo
Friday	Technical/historical tours: Ajloun Castle and Ancient Roman Jaresh
Saturday	*Optional – Irbid City tour.*
Week 2: Sept 1 – Sept 7	
Sunday	Technical Tour: Al Arab Water Treatment Plant Cultural Tour: Pella
Monday	Lecture: Water Governance in Jordan, Dr. Munjed Al Sharif *Group activity on water governance*
Tuesday	Technical tour: Zai Water Treatment Plant

Date	Course work/ Activity
Wednesday	Lecture: Into to desalination, Mr. Jaffer Alali Lecture: The Red-Dead Conveyance Project, Dr. Hani Abu Qdais
Thursday	Technical Tour: Wadi Ma'in, Zara, and Mujib Water Treatment facility Dead Sea access at Wadi Mujib (overnight stay)
Friday	Hiking at Wadi Mujib
Saturday	
Week 3: Sept 8 – Sept 14	
Sunday	Quiz 2 Lecture: Water Demand Management, Dr. Hani Abu Qdais *Project meetings with instructors*
Monday	Lecture: Water-related diseases in MENA region, Dr. Muna Hindiyeh
Tuesday	Lecture: Non-poatable Graywater Reuse Systems, Dr. Wa'il Abu El-Shar Lecture: Rural on-site graywater demonstrations project, Dr. Maha Halalsheh
Wednesday	Lecture: Dr. Ziad Al-Ghazawi Wastewater reuse and intro to RIAS Technical tour: JUST WWTP and reuse project
Thursday	Technical tour: RIAS project Wadi Rum (overnight)
Friday	Technical tour with Guest lecture: Water Systems of the Ancient Nabateans (Petra) – Dr. Wa'il Abu El-Shar
Saturday	
Week 4: Sept 15 – Sept 21	
Sunday	Technical tour: Septage disposal facility, and Umm Jimal Roman Water system renovations
Monday	Lecture: Jordan River Rehabilitation, Dr. Samer Talozi Lecture: Wastewater Treatment in Jordan, Dr. Jamal Abu Ashour
Tuesday	Technical tour: Ramtha WWTP
Wednesday	Quiz 3 *Project Meetings with Instructors*
Thursday	*Student Project Presentation*
Friday	Packing and Final program wrap-up
Saturday	Students depart from JUST
Sunday Sept 22	Dr. Gough and Mr. Alali depart from JUST

Teaching approach

Both the UW and the Jordan portions of this course will focus on learning from field observations, targeted scholarly readings, expert topical lectures (i.e. guest lectures), instructor "core topic" lectures, group discussions, team-based problem solving, and student presentations of scientific information.

Student work and assignments

Student work outside of field visits and lectures will consist of the following

- **Reading Assignments** – there will be 5-7 assigned papers for reading each week of the course. Readings have been selected to enhance learning during the technical tours and lectures, and

should be read in advance. URLs of the reading will be posted on the course webpage. Some reading will be from books made available during the course.

- **Problem solving** (team-based and individual) – 4-6 problems will be assigned based on the course content and readings. Problems will be designed for completion in 1-2 hours. Problems may be computational or descriptive in nature.
- **Study Log –** Students will keep a log recording their thought and questions that arise from lectures, readings, and field visits. In some cases, the topics for discussion may be assigned by the instructor. These individual thoughts will form the basis of small group discussion.
- **Group discussions** – students will participate in 2-3 small group discussion each week focused on materials covered in readings, field visits or lectures. Discussion results will be shared during large-group classroom discussions.
- **Project** – Small student teams will pick one course unit area for more in-depth exploration. Instructors will assist the project teams to identify additional learning resources (additional readings, JUST faculty experts, focused portions of field visits, etc.). The project teams will then teach the rest of the class about their topic area through a course presentation. Alternatively, if teams have the necessary technical expertise, a "YouTube" style video can be substituted for the classroom presentation – ask for instructor approval before starting.

Grading

Students should expect grades to be comparable to those awarded for on-campus study. Measures of learning will include:

- Classroom and field trip participation: 10%
    - Attendance is mandatory (including spring quarter activities), and missing may be grounds for dismissal from the class (as part of the Study Abroad Department policies)
    - Being present is not the same as participating
- Study Logs: 20%
    - Collected once per week on a rotating basis (so that instructor can return them quickly). A Schedule will be posted.
    - Grading:
        - 4 = Thoughtful notes with signs of critical thinking, observations, and questions focused on the course goals. Evidence of activities to answer one's own questions. Preparation for discussions is evident. Shows improvement based on previous instructor comments.
        - 2 = some questions for discussions, lacks in-depth thought or independent thinking. Shows improvement based on previous instructor comments.
        - 1 = some notes, no clear evidence of discussion preparation
- Discussion participation: 15%
- Problem sets: 20%
- Quizzes: 20%
- Projects: 15% (more detail below)

Late work will not be graded. Students with excused absences (e.g. health reasons or other extreme concerns) should speak with the instructor.

Project Guidelines

Groups:

Groups should consist of between 2-4 members formed based on shared interest area or shared final product format (see below). Discussion prior to the start of class is encouraged to identify other students with similar interests. (groups of 1 may be allowed – please consult the instructor)

Topics and focus:

Groups will choose one Unit area for greater focus. Within that unit, a focused topic should be created. Instructors will discuss topic focus with each group within the first few days of class. The focus area should:

- Be supported by additionally scholarly or text readings
- Be supported by field trip experiences during class
- Be focused enough to allow completion during approximately 15 hours of group work (excludes reading time).
- Should require reading no more than 3 additional scholarly papers to text book sections.

Schedule:

Spring Quarter Week 6 – Intro to project and brainstorm session of interesting topics
Aug 29 – Project selection and group assignment
Sept 1 – Lit review due (lists of abstracts and text sections read along with notes)
Sept 4 – Outlines due
Sept 19 – Final projects due and classroom presentations
Instructors are available for consultation at each step in the project. Some dedicated instructor time has been set aside for project meetings; additional meetings will be arranged if either the instructors' or the students' request.

Final product:

Projects are expected to demonstrate rigorous study and scientific understanding. As this course is a non-traditional learning environment, non-traditional project formats are encouraged. Some ideas include:

- Powerpoint presentation with sufficient information for posting to the course webpage.
- Visual performance – dance, or dramatic sketch (these will be video-recorded and posted on the webpage or YouTube)
- Written performance – poetry, music lyrics, etc. (these will be read/performed in front of the class, and the words posted to the class webpage)
- YouTube style short documentary (will be posted to YouTube).

Elements of a quality project (i.e. grading rubric):

Scientific Content (50%) – scientific elements are clearly explained or demonstrated. There is strong evidence that the team has studied and understands the topic focus.
Presentation (30%) – the presentation is neat, organized, and well rehearsed.
Creativity (20%) – the presentation is graphically or visually interesting.
Bonus (up to 5%) – Materials from field trips are incorporated into the presentation in meaningful ways (such as photos), or other considerations at the instructor's discretion.