Sultan Qaboos University
Course outline

Program:water tecnology

Course Code	SWAE4006	
Course Title	Arid Zone Hydrology	
Credits	3 CR, 12 CP, 6 ECTS	
Pre-requisite	SWAE3310: Elements of Hydrology, (SWAE 2201 or SWAE2001 or	
Co-requisite	-	
Equivalent		
Course Category	☐ University Requirement	☐ University Elective
	☐ College Requirement	☐ College Elective
	☐ Department Requirement	☒ Department Elective
	☐ Specialization Requirement	☐ Specialization Elective
	☐ Other (specify):	
Course Owner	College: CAMS	Department:SWAE
Course Type	☐ Lecture	☐ Lecture/Lab
	☐ Lecture/Seminar	☐ Lecture/Studio
	☒ Lecture/Tutorial	☐ Lecture/Lab/Seminar
	☐ Tutorial	☐ Lab or Practical
	☐ Field Work	☐ Field Placement
	☐ Studio	☐ Seminar
	☐ Internship	☐ Workshop
	☐ English Language Skill	☐ Project
Language of	English	

Course Description
This course is aimed at providing the student with a comprehensive introduction to the most important topics in aridity and arid zone hydrology/hydrogeology and its environment. The course will discuss the basics and characteristics of hydrology in arid regions. Students will gain basic knowledge about factors that cause aridity, why Oman and the Arabian Peninsula is an arid zone. The course starts with discussing characteristics of arid zone and reasons of aridity and climate of Oman and the Middle East. It will be followed by key environmental issues such as aquifer mining, seawater intrusion, artificial recharge, desertification, and greening deserts. Students will learn techniques to analyze extreme hydrologic events, spatial dependence of hydrological features, spatial and temporal variability of hydrological events as rainfall and features of runoff. Computer simulations that enable the students to explore different scenarios in management or investigate the most likely outcome of a course of action in hydrological systems will be covered.

Teaching/Learning Strategies

Evaluation Methods
Home work Assignments Home work assignments will be due in most of the cases by one week (otherwise due dates will be announced). Team work is encouraged but does not mean that each assignment is done by only one team member without the contribution and involvement of all team members. Instructions for home work and reports preparation will be given in class. All home work assignments should be very well written with MSWord and neat. All Assignments should be submitted on time. Late home works and reports are not accepted, and will automatically result in a grade equal to zero. Paper Review Selected published papers (or a topic) asscoaited with Arid zone hyfdrology will eb assigned to group of studenets. Studenets are asked to develop an excllent understanding of their selected title by reading the literature, then deliver a 15 min presentation to the class followed with 15 min of discussion. Stuxents will be evaluated by a poanel (invited instructoers) based on a set of critrion as: clarity of presentation, knowledge of the subject, style of presentation and quality of the slides, and performance in the queation and answer session. Questions about the material discussed by the selected paper will be included in the final exam. Tests There will be two tests each of one hour duration. The tests will count for 20% of the course mark. Final Exam This will be a three-hour examination and the date and time will be announced by the University timetabling office prior to exams. Mark Scheme The final course grade will be weighted according to the following scheme: (1) Homework Assignments, paper review, presentation & discussion 10% (2) Test 1(Thursday lecture, week 6) 20% (3) Test 2(Thursday lecture, week 12) 20% (4) Final Exam 50% Total: 100%

Required Course Core Material
The following books, chapters and journals are the reading materials for the course: Textbook: • Wadi Hydrology textbook: Zekai Sen, 2008, Wadi Hydrology, Crc Press. ISBN:1420061542 along with chapters or sections from a number of textbooks along with published papers from different sources will be distributed to the students during the lectuers. Those includes:

- Todd, D. K., 1980. Groundwater Hydrology, Second Edition, John Wiley & Sons, Inc., USA (Chapter 4, 13, and 14) from.
- Maliva, R., Missimer, T., 2012. Arid Lands Water Evaluation and Management. Springer Heildberg. ISBN 978-3-642-29103-6
- Zekai Sen, 2008, Wadi Hydrology, Crc Press. ISBN:1420061542

Number of journals
(To chase update in the field of arid zone hydrology)

1. Journal of Arid Environment, Copyright © 2008 Academic Press.
2. Advances in Water Research, Copyright © 2008 Elsevier B.V. All rights reserved, Shortcut URL to this page: http://www.sciencedirect.com/science/journal/03091708
3. Journal of Hydrology, Copyright © 2008 Elsevier Ltd. All rights reserved Shortcut URL to this page: http://www.sciencedirect.com/science/journal/00221694

Matching Course Objectives with Program Outcomes and SQU Graduate Attributes		
SQU Graduate Attributes		
SQU graduates should be able to: apply the knowledge and skills relevant to the specialization communicate effectively and use information and communication technologies critically analyze complex information and present it in simple legible manner	SQU graduates possess interpersonal communication skills and alignment with culture of international labour market to assist them in practical life and in living successfully skills and motivation for independent learning and engagement in lifelong learning and research work ethics and positive values, and intellectual independence and autonomy teamwork skills and display potential leadership qualities	SQU graduates should relish good citizenship qualities, conscious of their national identity and socially responsible, engage in community affairs and mindful of contemporary issues.

#	Course Learning Objective	Relevant Program Outcome(s)	Applicable Attribute(s)
	Develop a conceptual understanding of arid environment, causes of aridity and how to measure the degree of dryness in a certain location as well as highlighting the main characteristics of arid zone environment. (Objectives A, and B).	Objective A: Provide the required knowledge and skills to solve water resources management problems in arid regions. Objective B: Develop the abilities to stay current with new developments in the field of Water technology.	SQU attribute "A1"
	Provide the students with the necessary skills in analyzing hydrological data of climatological processes (as rainfall, runoff) that are complicated	Objective A: Provide the required knowledge and skills to solve water	SQU attributes "A1", and

	by there sporadic and erratic patterns. Methods used in analyzing rainfall and runoff data will be covered. (Objectives A, and B).	resources management problems in arid regions. Objective B: Develop the abilities to stay current with new developments in the field of Water technology.	"A2", and "A3"
	Knowledge about hydrological features in Oman (ephemeral wadies flow, springs, AFlaj system, and Sabkhas) (Objectives C, D, and E).	Objective C: Develop an ability to identify, formulate and solve technical problems in the field of water resources including irrigation, water & wastewater treatment, water supply and desalination. Objective D: Impart technical skills, modern problem solving tools, on-the-job training to the students to enable them contribute effectively in the Omani water sector. Objective E: Develop abilities to communicate effectively, to work in multi-disciplinary teams, and to understand professional and ethical responsibility.	SQU attributes "A3", "B1", "B2", "B3", "B4", and "C".
	Equip the students with good modeling skills in the area of seawater intrusion, aquifer mining, artificial recharge, and flood prediction. (Objectives A, B, C, and D).	Objective A: Provide the required knowledge and skills to solve water resources management problems in arid regions. Objective B: Develop the abilities to stay current with new developments in the field of Water technology. Objective C: Develop an ability to identify, formulate and solve technical problems in the field of water resources	SQU attributes "A3", "B1", "B2", "B3", "B4", and "C".

		including irrigation, water & wastewater treatment, water supply and desalination. Objective D: Impart technical skills, modern problem solving tools, on-the-job training to the students to enable them contribute effectively in the Omani water sector.	
	Highlight the issue of desertification, hydrological indicators, and possible options to deal with the problem of desertification in Oman. (Objectives C, D, and E)	Objective C: Develop an ability to identify, formulate and solve technical problems in the field of water resources including irrigation, water & wastewater treatment, water supply and desalination. Objective D: Impart technical skills, modern problem solving tools, on-the-job training to the students to enable them contribute effectively in the Omani water sector. Objective E: Develop abilities to communicate effectively, to work in multi-disciplinary teams, and to understand professional and ethical responsibility.	SQU attributes "A3", "B2", , "B4", and "C".

Student Responsibilities
It is the student's responsibility to know and comply with all University Academic Regulations relevant to participation in this course. These regulations specifically include attendance requirement and students` academic code of conduct. For attendance, it is the student's responsibility to be punctual and to attend all classes. Students are expected to perform their work with honesty and avoid any academic misconduct, which is defined as the use of any dishonest or deceitful means to gain some academic advantage or benefit. This can take many forms, including but not limited to, the following: copying, plagiarism, collusion and forging documents. For full details please refer to the Undergraduate Academic Regulations and to the Student Academic Misconduct Policy. Additionally, this course requires that you: Failure to take an exam or submit a scheduled assignment will result in an automatic grade of zero. Under exceptional conditions, a medical condition may entitle a student to make up a missed test or assignment, provided that a medical certification extended by a licensed physician is presented within 2-3 days of the scheduled time of the exam or due time of the assignment. The certification must be submitted to the instructor together with an explanation on how/why the medical condition prevented the student from fulfilling his/her course work. Collaboration Policies: You can consult each other while working on the home works, but all the work that you submit must be your own. There will be group home works also. Discuss the assignments among yourselves. This is helpful to the learning process. However, direct copying of others work will NOT be allowed or tolerated and will result in a considerable reduction of grade. Attendance Policy: Attendance to lecture is compulsory by the university laws. Homework, reports, and test questions depend heavily on lectures and instructions provided during the lectures. Past experience shows that failure to attend lectures regularly leads to deficient grades in this course. Quizzes will be given during lectures without prior notices.

Course INFORMATION

Course Code	SWAE4006	Course Title	ARID ZONE HYDROLOGY
Year/Semester	2016/FALL	Section	10
Day, Time, and Place	Tue. 10:00–11:20 AM CMT/A05 Thu. 08:00–09:20 AM CMT/A05		

Course Coordinator	Dr. Ali Al-MAktoumi		
Office Location	Assistant Dean, #2005, 2nd Floor, CAMS	Office Hours	announced each semester
Office Tel. Ext.	2415-1235	Email	ali4530@squ.edu.om

Tentative Schedule

Week	Lecture/Topic	Material to be covered	Assignment/Exam	Weight (%)
1	Introduction, Review of Hydrologic processes, Characteristics of Arid Zones			
2	Characteristics of Arid Zones, Reasons for Aridity,			
3	Reasons for Aridity of the Middle east, Climate of Middle East & Oman,			
4	Rainfall characteristics in arid zones, Analysis of rainfall in arid zones		HW 1	1%
5	Tutorial about rainfall analysis			
6	Wadi Characteristics, Springs and Aflaj systems, Sabkhas		test 1	20%
7	Rainfall and runoff relations		HW 2	1%
8	Methods of estimation of Runoff			
9	Methods of estimation of Runoff			
10	Tutorial about estimation of Runoff		HW 3	1%
11	Groundwater management		HW 4	1%
12	Estimation of Rechgarge rate		test 2	20%
13	desertification, causes, opions for compat desertification		HW 5	1%
14	Paper review, presentation, and discussion			
15	Paper review, presentation, and discussion		Submission of the review and conduct a presentation	5%

appendix A: Instructors of multiple sections

Section	Instructor	Day, Time, and Location	Office Location and Extension	Email	Office Hours

appendix B: ADDITIONAL INFORMATION