



## Course Syllabus: Contemporary Topics in ErSE - ErSE 394

<b>Division</b>	Physical Science and Engineering Division
<b>Course Number</b>	ErSE 394
<b>Course Title</b>	Contemporary Topics in ErSE
<b>Academic Semester</b>	Fall
<b>Academic Year</b>	2019/2020
<b>Semester Start Date</b>	08/25/2019
<b>Semester End Date</b>	12/10/2019
<b>Class Schedule</b> (Days & Time)	02:30 PM - 04:00 PM   Sun Thu

Instructor(s)				
Name	Email	Phone	Office Location	Office Hours
Shuyu Sun	shuyu.sun@kaust.edu.sa	+966128080242	OFFICE 4424, FLOOR 4, BLDG 1, 1, Al- Khawarizmi (bldg. 1)	By appointment.

Teaching Assistant(s)	
Name	Email

Course Information	
<b>Comprehensive Course Description</b>	The course will include an introduction to hydrological cycle and basic understanding of groundwater hydrology including groundwater properties and general flow equations. The course will also cover understanding of steady-State well hydraulics, steady radial flow (confined, unconfined). In addition, both anthropogenic and natural contamination sources will be considered. It will include basic understanding of conceptual site model, data collection, groundwater monitoring, and data illustration.
<b>Course Description from Program Guide</b>	A course of current interest. Topics are not permanent and the content of the course will change to reflect recurring themes and topical interest. The content will be approved by the division.
<b>Goals and Objectives</b>	The aim of this course is to introduce modeling techniques for subsurface porous media flow and contaminant transport. At the end of the course students will be able to construct models that represent typical scenarios of subsurface flow and transport, and students are expected to be able to implement the mathematical models into numerical simulators using a high-level programming languages.
<b>Required Knowledge</b>	Basic numerical PDE course and basic programming skills, or consent of instructor
<b>Reference Texts</b>	Groundwater Contamination, Transport and Remediation, 2nd edition; Philip B. Bedient, Hanadi S. Rifai, Chares J. Newell. Modeling Groundwater Flow and Contaminant Transport, by Jacob Bear and Alexander H.-D. Cheng. Published by Springer. 1st edition (January 1, 2010). ISBN: 978-1402066818. The instructor will provide additional reading material.
<b>Method of evaluation</b>	<b>60.00%</b> - Course Project(s) <b>20.00%</b> - Scientific review article presentation <b>10.00%</b> - Oral Quizzes <b>10.00%</b> - Attendance and Participation

<b>Nature of the assignments</b>	1) Assigned weekly reading, 2) In-class case study, 3) Mid-term paper presentation, 4) Visiting industrial sites 5) Final course project (group project)
<b>Course Policies</b>	Absence requires documented justification.
<b>Additional Information</b>	

### Tentative Course Schedule

*(Time, topic/emphasis & resources)*

Week	Lectures	Topic
1	Sun 08/25/2019	Semester starts; Introduction to groundwater flow
1	Thu 08/29/2019	Introduction to groundwater contamination
2	Sun 09/01/2019	Introduction to contaminant transport
2	Thu 09/05/2019	Introduction to groundwater hydrogeology
3	Sun 09/08/2019	Groundwater flow modeling basics
3	Thu 09/12/2019	Well mechanisms for groundwater
4	Sun 09/15/2019	Sources of groundwater contamination
4	Thu 09/19/2019	Types of groundwater contamination
5	Sun 09/22/2019	University holiday
5	Thu 09/26/2019	Hydrogeological site investigation
6	Sun 09/29/2019	Contaminant transport mechanisms
6	Thu 10/03/2019	Contaminant fate processes
7	Sun 10/06/2019	Modeling of groundwater flow
7	Thu 10/10/2019	Modeling of groundwater contaminant transport
8	Sun 10/13/2019	Algorithm for convection
8	Thu 10/17/2019	Algorithm for diffusion and dispersion
9	Sun 10/20/2019	Algorithm for adsorption and desorption
9	Thu 10/24/2019	Groundwater modeling applications
10	Sun 10/27/2019	Mid-semester break
10	Thu 10/31/2019	Industrial site visiting I
11	Sun 11/03/2019	Non-aqueous phase liquids
11	Thu 11/07/2019	Monitoring of contaminants
12	Sun 11/10/2019	Monitoring of contaminants (cont.)
12	Thu 11/14/2019	Conceptual site models
13	Sun 11/17/2019	Risk assessment for groundwater contaminants
13	Thu 11/21/2019	Groundwater remediation techniques
14	Sun 11/24/2019	Industrial site visiting II
14	Thu 11/28/2019	Modeling of groundwater remediation
15	Sun 12/01/2019	Case studies and applications (I)
15	Thu 12/05/2019	Case studies and applications (II)
16	Sun 12/08/2019	Exams

**Note**

The instructor reserves the right to make changes to this syllabus as necessary.