



## 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>	Spring
<b>Academic Year</b>	2017/2018
<b>Semester Start Date</b>	01/28/2018
<b>Semester End Date</b>	05/24/2018
<b>Class Schedule</b> (Days & Time)	09:00 AM - 10:30 AM   Mon Wed

**Instructor(s)****Name****Email****Phone****Office Location****Office Hours**

<b>Name</b>	<b>Email</b>	<b>Phone</b>	<b>Office Location</b>	<b>Office Hours</b>

<p>Gerard Thomas Schuster</p>	<p>gerard.schuster@kaust.edu.sa</p>	<p>+966128080296</p>	<p><b>Instructors:</b> Jerry Schuster, Xiangling Zhang, Doug Foster, Saleh Dossary, Craig Foster</p> <p><b>Books:</b> Seismic Inversion, 2017, G.T. Schuster, SEG Press, Tulsa Ok. , Pattern Recognition and Machine Learning, 2007, Bishop. Suggested Readings: Amplitude Variation with Offset: Gulf Coast Case Studies, 1993, J. Allen and C. Peddy, SEG Publishing, Tulsa, OK, and Seismic Attributes for Prospect Identification and Reservoir Characterization, 2007, S. Chopra and K. Marfurt, SEG Publ., Tulsa, Ok.</p> <p><b>WWW site:</b> <a href="https://csim.kaust.edu.sa/files/ErSE398/ErSE394.html">https://csim.kaust.edu.sa/files/ErSE398/ErSE394.html</a></p> <p><b>Objective:</b> Overview of four important topics in exploration geophysics: AVO, Attributes, Skeletonized Inversion, and Seismic Artificial Intelligence. Specialists in all four areas will be invited to give lectures in their respective expertise. Dr. Schuster will provide introductory lectures and labs for all four topics, and the specialists will provide advanced details and class exercises. Some of the lectures will be by Prof. Xiangliang Zhang who teaches Machine Learning C229 (<a href="https://sites.google.com/site/kaust229machinelearning">https://sites.google.com/site/kaust229machinelearning</a>). A project will be required that uses the principles of skeletonized inversion to facilitate the use of AVO, Attributes, or Seismic Artificial Intelligence. Prerequisites for the course are Advanced Seismic Inversion ErSE 328-329 with the specialized topic of skeletonized inversion. <b>Instructor permission needed to register. No audits.</b></p>
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**Format:** 3 hours credit, meet twice/week for 1.5 hours/class unless short course is given 6 hours/week. **Labs:** YouTube videos and Computational Labs. Well log data to come from [here](#).

## Teaching Assistant(s)

Name	Email
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## Course Information

<b>Comprehensive Course Description</b>	Overview of four important topics in exploration geophysics: AVO, Attributes, Skeletonized Inversion, and Seismic Artificial Intelligence. Specialists in all four areas will be invited to give lectures in their respective expertise. Dr. Schuster will provide introductory lectures and labs for all four topics, and the specialists will provide advanced details and class exercises. Some of the lectures will be by Prof. Xiangliang Zhang who teaches Machine Learning C229 ( <a href="https://sites.google.com/site/kaust229machinelearning">https://sites.google.com/site/kaust229machinelearning</a> ). A project will be required that uses the principles of skeletonized inversion to facilitate the use of AVO, Attributes, or Seismic Artificial Intelligence. Prerequisites for the course are Advanced Seismic Inversion ErSE 328-329 with the specialized topic of skeletonized inversion. <b>Instructor permission needed to register.</b>
<b>Course Description from Program Guide</b>	
<b>Goals and Objectives</b>	Overview of four important topics in exploration geophysics: AVO, Attributes, Skeletonized Inversion, and Seismic Artificial Intelligence. Specialists in all four areas will be invited to give lectures in their respective expertise. Dr. Schuster will provide introductory lectures and labs for all four topics, and the specialists will provide advanced details and class exercises. Some of the lectures will be by Prof. Xiangliang Zhang who teaches Machine Learning C229 ( <a href="https://sites.google.com/site/kaust229machinelearning">https://sites.google.com/site/kaust229machinelearning</a> ). A project will be required that uses the principles of skeletonized inversion to facilitate the use of AVO, Attributes, or Seismic Artificial Intelligence. Prerequisites for the course are 2 semesters of Advanced Seismic Inversion ErSE 328-329 with the specialized topic of skeletonized inversion. <b>Instructor permission needed to register.</b>
<b>Required Knowledge</b>	Advanced Seismic Inversion ErSE 328-329 with the specialized topic of skeletonized inversion is required to take this course. <b>Permission from the instructor is also required.</b>
<b>Reference Texts</b>	<b>Books:</b> Seismic Inversion, 2017, G.T. Schuster, SEG Press, Tulsa Ok. , Pattern Recognition and Machine Learning, 2007, Bishop. Suggested Readings: Amplitude Variation with Offset: Gulf Coast Case Studies, 1993, J. Allen and C. Peddy, SEG Publishing, Tulsa, OK, and Seismic Attributes for Prospect Identification and Reservoir Characterization, 2007, S. Chopra and K. Marfurt, SEG Publ., Tulsa, Ok.  <b>WWW site:</b> <a href="https://csim.kaust.edu.sa/files/ErSE398/ErSE394.html">https://csim.kaust.edu.sa/files/ErSE398/ErSE394.html</a>
<b>Method of evaluation</b>	<b>25.00%</b> - Homework /Assignments <b>25.00%</b> - Midterm exam <b>25.00%</b> - Final exam <b>25.00%</b> - Course Project(s)
<b>Nature of the assignments</b>	Written assignments. See <a href="https://csim.kaust.edu.sa/files/ErSE398/ErSE394.html">https://csim.kaust.edu.sa/files/ErSE398/ErSE394.html</a>
<b>Course Policies</b>	Projects to be presented along with a written report
<b>Additional Information</b>	<a href="https://csim.kaust.edu.sa/files/ErSE398/ErSE394.html">https://csim.kaust.edu.sa/files/ErSE398/ErSE394.html</a>

## Tentative Course Schedule

*(Time, topic/emphasis & resources)*

Week	Lectures	Topic
1	Mon 01/29/2018	Overview of Course
1	Wed 01/31/2018	Neural Networks
2	Mon 02/05/2018	no class
2	Wed 02/07/2018	no class
3	Mon 02/12/2018	Introduction to Machine Learning
3	Wed 02/14/2018	Supervised Learning Basics
4	Mon 02/19/2018	Neuron Network and Deep Neuron Network
4	Wed 02/21/2018	Unsupervised Learning
5	Mon 02/26/2018	Neural Networks and Well Log Prediction
5	Wed 02/28/2018	Neural Networks and Tomogram Correction
6	Mon 03/05/2018	Accelerating NN with a Subspace Method
6	Wed 03/07/2018	ML and Correction of Migration Artifacts
7	Mon 03/12/2018	ML meets Seismic Interpretation I
7	Wed 03/14/2018	ML meets Seismic Interpretation II
8	Mon 03/19/2018	AVO Short Course (Doug Foster)
8	Wed 03/21/2018	AVO Short Course (Doug Foster)
9	Mon 03/26/2018	Attributes Short Course (Saleh Dossary)
9	Wed 03/28/2018	Attributes Short Course (Saleh Dossary)
10	Mon 04/02/2018	Spring Break
10	Wed 04/04/2018	Spring Break
11	Mon 04/09/2018	Big Data and ML Short Course (Craig Douglas)
11	Wed 04/11/2018	Big Data and ML Short Course (Craig Douglas)
12	Mon 04/16/2018	Wave Equation Skeletonized Inversion I
12	Wed 04/18/2018	Wave Equation Skeletonized Inversion I
13	Mon 04/23/2018	Wave Equation Skeletonized Inversion II
13	Wed 04/25/2018	Wave Equation Skeletonized Inversion II
14	Mon 04/30/2018	Projects Update by Students
14	Wed 05/02/2018	Projects Update by Students
15	Mon 05/07/2018	Projects Update by Students
15	Wed 05/09/2018	Projects Update by Students
16	Mon 05/14/2018	
16	Wed 05/16/2018	
17	Mon 05/21/2018	
17	Wed 05/23/2018	

### Note

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