جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Seismic Imaging - ErSE 260

Division	Physical Science and Engineering Division
Course Number	ErSE 260
Course Title	Seismic Imaging
Academic Semester	Fall
Academic Year	2019/2020
Semester Start Date	08/25/2019
Semester End Date	12/10/2019
Class Schedule (Days & Time)	01:00 PM - 02:30 PM | Mon Wed

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Tariq Ali Alkhalifa	tariq.alkhalifah@kaust.edu.sa	+966128080282		3-4 Mon. and Wed.

Teaching Assistant(s)

Name	Email
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Course Information

Comprehensive Course Description	We introduce the concept of seismic imaging in the framework of wavefield extrapolation and the imaging condition. We look at the various migration methods including Kirchhoff, phase-shift migration, Downward continuation methods, reverse time migration and others. We look at the impact of velocity and the role of imaging in estimating the velocity model.
Course Description from Program Guide	This course is devoted to studying the concept of seismic imaging for exploration purposes. We introduce seismic imaging in the framework of Greens functions and wavefield extrapolation and discuss the various imaging conditions. We look at the various migration methods including Kirchhoff, phase-shift migration, Downward continuation methods, reverse time migration, and others. We discuss the role that velocity plays in the seismic imaging process.
Goals and Objectives	To understand and learn the fundamentals of seismic imaging and physical and mathematical framework behind its many concepts. with objectives to learn: -Wave propagation -High frequency asymptotics. -The concept of Seismic imaging. -Integral migration methods. -Fourier-based methods. -Prestack depth migration. -The role of velocity. -The double square formulation. -Sage
Required Knowledge	Reasonable math, specifically PDE and linear Algebra

Reference Texts	Class notes (CN) + Theory of Seismic Imaging (TSI) by John Scales The book can be downloaded freely from Samizdat Press http://samizdat.mines.edu/imaging/ **Additional References:** *Imaging the Earth Interior* by Jon Claerbout can be downloaded freely from http://sepwww.stanford.edu/sep/prof/iei/toc_html/
Method of evaluation	**50.00**% - Homework /Assignments **15.00**% - Midterm exam **35.00**% - Final exam
Nature of the assignments	Exams will represent 50% of the final course grade. There will be one midterm exam and one (final) exam in the lecture part of the course. Homework and a final project will represent the remaining 50% of the final course grade and will consist of a series of homework exercises designed to help you learn the essence of seismic imaging. Individual homework exercises (10%) will be designed to complement our progress in class and it will include codes to achieve parts of what learned. These exercises are preparatory for the understanding of the concept that is compiled into a final formally written report (40%) that will be submitted at the end of the course.
Course Policies	Late homework submissions -20% of the homework grade up to a week after the deadline.
Additional Information	

Tentative Course Schedule *(Time, topic/emphasis & resources)*		
Week	**Lectures**	**Topic**
1	Mon 08/26/2019	Introduction to Seismic Imaging
1	Wed 08/28/2019	Introduction to Seismic Imaging
2	Mon 09/02/2019	Wavefields and Wave propagation
2	Wed 09/04/2019	Wavefields and Wave propagation
3	Mon 09/09/2019	Wavefields to Wavefronts
3	Wed 09/11/2019	Wavefields to Wavefronts
4	Mon 09/16/2019	Modeling in time and frequency
4	Wed 09/18/2019	Modeling in time and frequency
5	Mon 09/23/2019	Saudi National Day
5	Wed 09/25/2019	The concept of imaging
6	Mon 09/30/2019	Modeling and the forward problem-exploding reflector
6	Wed 10/02/2019	Modeling and the forward problem-exploding reflector
7	Mon 10/07/2019	Integral Imaging methods - Kirchhoff
7	Wed 10/09/2019	Integral Imaging methods - Kirchhoff
8	Mon 10/14/2019	Time migration and Zero-offset to Prestack
8	Wed 10/16/2019	Time migration and Zero-offset to Prestack
9	Mon 10/21/2019	Imaging in the Fourier domain
9	Wed 10/23/2019	**Midterm Exam**
10	Mon 10/28/2019	Mid-semester break
10	Wed 10/30/2019	Mid-semester break
11	Mon 11/04/2019	**Wave equation methods and Downward continuation**
11	Wed 11/06/2019	**Wave equation methods and Downward continuation**
12	Mon 11/11/2019	**Reverse time migration**
12	Wed 11/13/2019	**Reverse time migration**
13	Mon 11/18/2019	**The velocity issue, image/angle gathers and MVA**
13	Wed 11/20/2019	**The velocity issue, image/angle gathers and MVA**
14	Mon 11/25/2019	**Exploding reflector modeling and migration-prestack**
14	Wed 11/27/2019	**Exploding reflector modeling and migration-prestack**
15	Mon 12/02/2019	**Waveform inversion and LS migration**
15	Wed 12/04/2019	**Waveform inversion and LS migration**
16	Mon 12/09/2019	Exams

Note

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