Seismic Imaging - Course Syllabus

Course Number: ErSE 260

Course Title: Seismic Imaging

Academic Semester:	Spring	**Academic Year:**	2015/ 2016
Semester Start Date:	Jan, 24, 2016	**Semester End Date:**	May, 19, 2016

Class Schedule: Monday and Wendesday 1-2:30PM

Classroom Number:

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Office Location: Building 1 Third floor room 3308
Office Hours: Monday and Wendesday 3-4

COURSE DESCRIPTION FROM PROGRAM GUIDE

Seismic migration methods are developed. Green's theorem is used to derive the Lippmann-Schwinger equation and the following migration methods: phase-shift migration, split-step and PSPI migrations, Fourier Finite Difference migration, phaseencoded multi-source migration, Kirchhoff migration, beam migration, diffraction stacK migration, reverse time migration, and migration velocity analysis.

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.

This course is devoted to the concept of seismic imaging for exploration purposes. We introduce seismic imaging in the framework of Green’s 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.

Proposed Course Schedule :

Week Topic Reading

Week 1 (Jan. 27th) Introduction to Seismic Imaging CN-Chapt1, TSI(p1-5)

Week 2 (Feb. 3st) Wavefields and Wave propagation CN-Chapt2

Week 3 (Feb. 10th) Modeling and the forward problem-exploding reflector CN-Chapt4, TSI(p7-9, p91-94)

Week 4 (Feb. 17th) Modeling exercise and assignment

Week 5 (Feb. 24rd) Wavefields to Wavefronts CN-Chapt3, TSI(p77-88)

Week 6 (Mar. 3rd) The concept of seismic imaging- the adjoint CN-Chapt5, TSI(p98-101) and the imaging condition

Week 7 (Mar. 11th) Integral Imaging methods - Kirchhoff CN-Chapt7, TSI(chapt.8, p111-114)

Week 8 (Mar. 18th) Time migration and Zero-offset to Prestack CN-Chapt6, TSI(p115-118)

Week (Mar. 25nd) Imaging in the Fourier domain - Midterm Exam

Week 9 (April 1st) Spring Break

Week 10 (Apr. 8th) Wave equation methods and Downward continuation CN-Chapt9, TSI(p119-126)

Week 11 (Apr. 15th) Reverse time migration (RTM) CN-Chapt10, TSI(p183-188)

Week 12 (Apr. 22nd) The velocity issue, image/angle gathers and MVA CN-Chapt11

Week 13 (Apr. 29th) The DSR formulation and Wide and Full azimuth

Week 14 (May 5th) Waveform inversion CN-Chapt12

Week 15 (May 12th) Review

Week 16 (May 19th) Final exams

GOALS AND OBJECTIVES

To understand the physics behind Seismic imaging and gain knowledge on the methods available to do so.

REQUIRED KNOWLEDGE

Seismology 1 or equivalent

REFERENCE TEXTS

1-Course notes

2-Theory of Seismic imaging, John Scales, available free online

METHOD OF EVALUATION

Percentages %	Graded content
50% **50%**	**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 Sage and Madagascar open source package excersizes.**

COURSE REQUIREMENTS

Assignments

Described above

Course Policies

Described above

Additional Information

https://sites.google.com/a/kaust.edu.sa/erse260/

http://www.reproducibility.org/wiki/Main_Page

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