האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

Introduction to Seismology - 70920

Last update 07-11-2021

HU Credits: 3

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: Geology

Academic year: 0

Semester: 2nd Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Dr. Ran Nof

Coordinator Email: ran.nof@mail.huji.ac.il

Coordinator Office Hours: sunday 08:30 - 10:00

Teaching Staff:

Dr. Lior Itzhak,
Dr. Nadav Venzler,
Dr. Ran Nofe

Course/Module description:

The main goal of seismology is to explore earthquakes by comparing seismic observations with models based on continuum mechanics and wave propagation theory.

In the shallow subsurface, earthquakes occur on faults - discontinuities in rock formations allowing for relative motion. Deep earthquakes also occur, yet their underlying mechanism is yet to be understood. Seismic waves emitted from deep earthquakes are similar to those originating from shallow earthquakes, so they may be studied using the same tools. In this course we will focus on shallow earthquakes.

To study earthquakes, we focus on studying faults along which rocks are held by frictional forces for the most part. Friction is the force that resists motion. Earthquakes are the expression of a sudden movement along the fault. This sudden movement releases part of the accumulated shear stress along the fault. The stress drop is the amount of stress released during the earthquake. This sudden slip along the fault releases seismic energy via waves, that allow us to study the earthquake.

This course consists of: introducing to fundamental seismological concepts, understanding the mechanisms in motion during an earthquake and the manner in which energy is distributed in time and space, and studying and exercising the use of computational tools (mostly python based). The course will include a field test and data analysis.

Course/Module aims:

The goal of the course is to provide a basic introduction to different seismological concepts and provide basic seismic processing capabilities for solving different computational problems in earthquake study. The emphasis in this course is more practical than theoretical and incorporates data processing.

Learning outcomes - On successful completion of this module, students should be able to:

By the end of the course, the students will be familiar with different seismological concepts, be able to obtain seismic earthquake data, analyze and present it. The course will provide the students with knowledge and experience in using Python for seismic processing.

Attendance requirements(%):
0

Teaching arrangement and method of instruction: Lectures and field lab

Course/Module Content:
Fundamental concepts in seismology
Stress, strain and the wave equation
Computational tools in seismology (Python applications)
Resolving seismograms
Seismic phases
Snell's law and wave-front
Velocity profile
Earth's structure
Filters
Attenuation
Seismological parameters
Earthquake location
Focal solutions
Source parameters (stress drop, slip model, magnitude, explosions)
Self-similarity
Earthquake statistics
Foreshock and aftershocks
Earthquake prediction models (ETAS)
Mega-earthquakes (Tohoku-Oki, Sumatra etc.)
Slab pull vs ridge push
Earthquake early warning and tsunami

Required Reading:
Book:
"Modern Global Seismology"
Thorne Lay
1995

Additional Reading Material:

Course/Module evaluation:
End of year written/oral examination 0 %
Presentation 0 %
Participation in Tutorials 0 %

Project work 0 %
Assignments 40 %
Reports 10 %
Research project 50 %
Quizzes 0 %
Other 0 %

Additional information: