DIPARTIMENTO DI SCIENZE

COURSE: SEISMOTECTONICS

ACADEMIC YEAR: **2017-2018**			
TYPE OF EDUCATIONAL ACTIVITY: (Basic, Characterizing, Affine, Free choice, Other)			
TEACHER: **FILIPPOS VALLIANATOS**			
e-mail: fvallian@chania.teicrete.gr		website:	
phone:		mobile (optional):	
Language:English			
ECTS: (lessons e tutorials/practice) **6**	n. of hours: (lessons e tutorials/practice) **56**	Campus:Potenza/Matera Dept./School: Potenza Program: Laurea Magistrale Internationale in Geoscienze e Georisorse	Semester: 1st

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

Knowledge

The course aims to provide an understanding of the dynamics of the solid Earth from theoretical and observational seismology and seismotectonics in relation to earthquake hazard and mitigation. It provides an in-depth study of earthquake seismology and earthquake hazard covering the following topics: Propagation of Seismic Waves; Earthquake Source Mechanics; Crustal Tectonics; Statistics of Earthquake. This is a geophysics based course, which covers the breadth of traditional seismology, developed from the seismic wave equation, and the physics of the earthquake source. The course covers fault mechanics, seismotectonics and earthquake statistics

Skills and Abilities

The aim of the course is students to gain knowledge and understanding seismotectonics based on fundamental geophysics of the seismic wave propagation and earthquake mechanics, in relation to earthquake hazard and mitigation. The course provides students with the mathematical and physical underpinning of the subject.
The students will acquire the following practical skills:

- Interpretation of earthquake seismograms
- Determining earthquake focal mechanisms and quantitative seismotectonics
- Practical approaches to earthquake hazard assessment
- Calculations based on statistical seismology laws

The students will acquire the following transferable skills:

- ✓ Processing, interpreting and presenting seismological data using the Matlab computer program
- ✓ Solving geophysical problems using computational and analytical techniques
- ✓ Using the Internet as a source of seismological information
- ✓ Application of statistics to hazard

PRE-REQUIREMENTS

Knowledge on the Principles of Geophysics and Tectonics

SYLLABUS

Part 1- Topic Observational Seismology- Principles of Seismology
1 Introduction
2 Earthquake Waves
Tutorials : Tu. 1 Earthquake Seismicity Tutorial, Tu. 2 Seismic Waves Tutorial
Self-study Tu. 3 Maths Tutorial
Practical : Earthquake Location Practical

Part-2 . Topic Observational Seismology - Principles of Seismology
3 Earthquake Rays and Earth Structure
Handouts Derivation of ray parameter; Crustal Phases
4 Surface Waves
Practical : Earthquake Location Practical - Handout Earthquake location

Part- 3 . Topic Earthquake Source Mechanics
5 Earthquake Focal Mechanism
6 Earthquake magnitude & intensity
Practical : Earthquake Location Practical - Handout Finding Earthquake Seismograms on IRIS
Tutorial : Fault Plane Solution & Seismotectonics

Part-4 . Topic Earthquake Source Mechanics
7 Seismic Moment
8 Global Seismotectonics
Practical : Fault Plane Solution
Handouts. Source parameters - Magnitude determinations - Magnitude calibration

Part- 5 . Topic Tectonics
9 State of Stress in the Crust- Strain Kinematics
10 Faulting
11 Earthquake cycle deformation
Practical : Coulomb Stress Practical
Tutorial : Stress-Strain Tutorial

Part- 6 . Topic Statistical Seismology
12 Earthquake Statistics
13 Earthquake Recurrence
Tutorial : Earthquake Hazard Exercise
Self-study Tu. Maths Tutorial (Poisson statistics)

TEACHING METHODS

The course is taught through:

- lectures supported by directed reading
- practical sessions on the interpretation of seismograms, seismotectonics (fault plane solution), stresses on faults, statistical seismology
- self-guided tutorials involving both numerical and analytical solutions of seismological and seismotectonics problems
- Use of the web for accessing seismological and geohazard data

Matlab programming language and use of tensors will be supported by self-guided tutorials. Additional tutorial support will be arranged as required.

EVALUATION METHODS

1. *Project work and presentation*
2. *Practical weekly homework*
3. *Final written test*

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- *Global tectonics*. Edited by P. Kearey - Keith A. Klepeis - Frederick J. Vine. Oxford: Wiley-Blackwell, 2009.

- STEIN, Seth and Michael WYSESSION.*An introduction to seismology, earthquakes, and earth structure*. Malden, Mass.: Blackwell Publishing, 2003.
- LAY, Thorne and Terry C. WALLACE.*Modern Global Seismology*. Academic Press, 1995.
- Shearer P M (1999) Introduction to Seismology, C.U.P.
- Bolt B A (2003) Earthquake 5th edition, W H Freeman & Co., New York
- Fowler C M R (2005) The Solid Earth 2nd edition, Cambridge University Press
- Gubbins D (1990) Seismology and Plate Tectonics, C.U.P.
- Bullen K E & Bolt B A (1987) An Introduction to the Theory of Seismology, C.U.P.
- Lomnitz C (1994) Fundamental of Earthquake Prediction, John Wiley & Sons
- Scholz C H (1990) The Mechanics of Earthquakes and Faulting, C.U.P.
- IASPEI New Manual of Seismological Observatory Practice (2002) ed P Bormann, GeoForschungs Zentrum Potsdam

INTERACTION WITH STUDENTS

The students can communicate with the lecturer within predifined time windows and to have a personal or group tutorial, to clarify after class points of discussion. In addition e-classs, emails and web communication will accelarate the interaction with the students.

EXAMINATION SESSIONS (FORECAST)[1]

In approximation, a weeks after the end of the Classes.

SEMINARS BY EXTERNAL EXPERTS YES □ **NO □X**

FURTHER INFORMATION

[1]Subject to possible changes: check the web site of the Teacher or the Department/School for updates.