

<b>COURSE: SEISMOTECTONICS</b>			
ACADEMIC YEAR: <b>2016-2017</b>			
TYPE OF EDUCATIONAL ACTIVITY: (Basic, Characterizing, Affine, Free choice, Other)			
TEACHER: <b>FILIPPOS VALLIANATOS</b>			
e-mail: fvallian@chania.teicrete.gr		website:	
phone:		mobile (optional):	
Language: English			
ECTS: (lessons e tutorials/practice) <b>6</b>	n. of hours: (lessons e tutorials/practice) <b>56</b>	Campus: Potenza/Matera Dept./School: Potenza Program: Laurea Magistrale Internazionale in Geoscienze e Georisorse	Semester: 3rd

**EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES**

Sintetizzare in lingua inglese i contenuti riportati nella scheda in lingua in italiana.

**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**

Sintetizzare in lingua inglese i contenuti riportati nella scheda in lingua in italiana.

**Knowledge on the Principles of Geophysics and Tectonics**

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SYLLABUS

Sintetizzare in lingua inglese i contenuti riportati nella scheda in lingua in italiana.

**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)

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TEACHING METHODS

Riportare una (o più) delle seguenti voci: Theoretical lessons, Classroom tutorials, Laboratory tutorials, Project works, Technical visits, Other activities (specificare).

Se utile, riportare ulteriori dettagli, come specificato nell'esempio riportato nella scheda in lingua in italiana.

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
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- 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.

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#### EVALUATION METHODS

Riportare una (o più) delle seguenti voci: Intermediate verifications, Written examination, Discussion of a project work, Practical test, Oral examination, Other methods (specificare).

Sintetizzare in lingua inglese i contenuti di dettaglio riportati nella scheda in lingua italiana.

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

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#### TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

Riportare in lingua inglese i contenuti riportati nella scheda in lingua italiana.

- *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* 5<sup>th</sup> edition, W H Freeman & Co., New York
- Fowler C M R (2005) *The Solid Earth* 2<sup>nd</sup> 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.
- **Reference** .IASPEI *New Manual of Seismological Observatory Practice* (2002) ed P Bormann, GeoForschungs Zentrum Potsdam

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#### INTERACTION WITH STUDENTS

Riportare in lingua inglese i contenuti riportati nella scheda in lingua italiana.

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

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#### EXAMINATION SESSIONS (FORECAST)<sup>1</sup>

Riportare le date inserite nella scheda in lingua italiana

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<sup>1</sup>Subject to possible changes: check the web site of the Teacher or the Department/School for updates.

LOGO DELLA STRUTTURA PRIMARIA

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In approximation, two weeks after the end of the Classes

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SEMINARS BY EXTERNAL EXPERTS    YES     **NO**

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FURTHER INFORMATION

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