

Geophysics 9524a: The Physics of Earthquakes
Course Syllabus – Fall 2016
(last updated on 12/09/ 2016)

Course Instructor: Prof. Robert Shcherbakov (office: B&GS 1080; e-mail: rshcherb [at] uwo.ca)

Lectures: Monday: 10:30 a.m. – 11:30 a.m.; Wednesday: 10:30 a.m. – 12:30 p.m. **BGS 1084.**

Lectures start on **September 14**

Office Hours: by appointment

Course Description:

This course provides an advanced overview of the physical mechanisms responsible for the occurrence of earthquakes. It introduces concepts and topics of the physics of earthquakes providing a way to study seismicity at different temporal and spatial scales. During the course students will be given an introduction into several fundamental physical concepts, which play key roles in understanding and studying various phenomena associated with earthquakes.

Prerequisites: Permission of the instructor. (*Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.*)

Summary of Lecture Topics (*approximate and subject to change!*):

- Earthquake phenomenology and source parameters;
- Elements of continuum mechanics;
- Earthquake mechanics and faulting;
- Elastodynamic description of rupture propagation;
- Statistics of seismicity;
- Elements of stochastic processes applied to seismicity;
- Earthquake simulation and modeling as a point process in space and time;
- Physics based models to describe the earthquake processes.

Recommended Textbooks:

- Stein S., Wyssession M., *An Introduction to Seismology, Earthquakes, and Earth Structure*, Blackwell, 2003.
- Aki K., Richards P.G., *Quantitative Seismology*, USB, 2002.
- Udias A., Madariaga R., Buforn E., *Source Mechanisms of Earthquakes. Theory and Practice*, Cambridge, 2014.
- Moczo P., Kristek J., Galis M., *The Finite-Difference Modelling of Earthquake Motions. Waves and Ruptures*, Cambridge, 2014.
- Kostrov B.V., Das S., *Principles of Earthquake Source Mechanics*, Cambridge, 2000.
- Newman W.I., *Continuum Mechanics in the Earth Sciences*, Cambridge, 2012.
- Biswas S., Ray P., Chakrabarti B.K., *Statistical Physics of Fracture, Breakdown, and Earthquake*, Wiley, 2015.

- Scholz C.H., *The Mechanics of Earthquakes and Faulting*, 2ed., Cambridge, 2002.
- Kagan Y.K., *Earthquakes. Models, Statistics, Testable Forecasts*, Wiley, 2014.
- Snieder R., van Wijk K., *A Guided Tour of Mathematical Methods for the Physical Sciences*, Cambridge, 2015.

Course Work

Assignments will consist of examination-style answer questions, and require no formal write-up. Late submissions will be accepted with a **5% per day penalty**. Under exceptional circumstances, late submissions will be accepted with no penalty, provided that adequate documentation is given. With a few exceptions, only SI units should be used to report any physical quantities.

The project will involve a written report and a brief oral presentation (10-15 minutes). The topic will be chosen by the student and approved by the instructor. Research topics must be in any area covered during the course. The project must include references to the scientific literature. Projects are due on December 1, and oral presentations will be given during the last week of the term. (*Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).*)

Method of Evaluation

Assignments	Project	Seminar Presentation
30%	50%	20%

Statement on Academic Offences: "Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: <http://www.uwo.ca/univsec/handbook/appeals/scholoff.pdf>."

Statements on special circumstances:

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see:

<http://www.uwo.ca/univsec/handbook/appeals/medical.pdf>

A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found here: https://studentservices.uwo.ca/secure/medical_document.pdf