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1-2015

### GEO 491.02: Special Topics - Exploration Geophysics

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**GEOS 491-02**  
**ST – EXPLORATION GEOPHYSICS**  
**SPRING SEMESTER 2015 SYLLABUS**

**Lecture:**

Days: Tuesday and Thursday  
Time: 3:10 pm to 4:30 pm  
Room: CHCB #333

**Laboratory:** None

**Course Instructor: Robert W. Lankston**

Office: CHCB 316

Phone: 243-????

Email: [bob.lankston@umontana.edu](mailto:bob.lankston@umontana.edu)

Office hours: 1:45 to 2:45 pm Tuesday and Thursday and by appointment.

**Course Text:**

*An Introduction to Applied and Environmental Geophysics, Edition 2*, by John M. Reynolds. Readings from internet sites and library reserve materials may also be assigned.

**Course Goal:**

To illustrate how basic geophysical methods are rooted in the principles of physics and the mathematics that describe those principles, and to illustrate how some common geophysical methods are applied for exploring for targets at various scales.

**Course Prerequisites:**

Trigonometry, differential calculus, integral calculus. College physics that includes potential field theory, basic electrical circuits and mechanical systems, interaction of magnetic fields and electrical currents, electrical concepts of resistance, capacitance, and inductance, electromagnetic and sound waves, optics, basic nuclear physics. Computer skills in Microsoft Word and Microsoft Excel. Basic Geology such as stratigraphy, structures, and mineralogy/petrology. Exemptions from prerequisites may be made on a case by case basis.

**Class Attendance:**

Attendance is required. Material will be presented in lecture that is not available through assigned readings or in Moodle postings. .

**Tentative Topical Schedule:**

Dates may vary slightly in response to student interests or difficulties.

**Dates/Topics**

**1/27** Introduction

**1/29 – 2/12** Gravity method

**2/17 – 2/26** Magnetic method

.....  
**3/3** Hour exam on gravity and magnetic methods.  
.....

**3/5 – 3/12** DC resistivity method  
**3/17** Induced polarization (IP) method  
**3/19** Electromagnetic (EM) method  
**3/24** Radiometry and well logs  
**3/26** Refraction seismic method

**3/30 – 4/3** Spring break

.....  
**4/7** Hour exam on electrical methods, radiometry, and well logs (*refraction seismic will be included on the final exam.*)  
.....

**4/9 – 4/16** Refraction seismic method  
**4/21 – 5/5** Reflection seismic method  
**5/7** Radar method

.....  
**5/14 Final Exam (Thursday, 1:10 PM to 3:10 PM)**  
.....

**Moodle:**

This syllabus, assignments, exam and homework scores, and other pertinent information will be posted on the Moodle page for this course. Classwide emails may be launched from Moodle or Cyberbear.

**Homework Submittals:**

Homework will be accepted electronically in Microsoft Word and Microsoft Excel. PDF files will not be accepted. Reports laid out with Latex will not be accepted. Matlab files will not be accepted. With permission of the instructor, Python files will be accepted. Submitted files must be compatible with software on Geosciences Department systems. Students who prepare work on non-department systems should check that any submitted files are completely readable/executable on the department systems.

Reports submitted in Word must have suitable graphics with captions and numbers, section headings, page numbers, equations, and references. References to illustrations and literature/internet sources are expected in the text of a report. Grades will be reduced for misspellings, poor grammar, and missing attributions. Students wishing written feedback on reports may submit a printed copy in addition to the electronic file. Word files are typically prepared with an 11 point Arial/Calibri font with 1.5 or double line spacing.

Computational projects submitted in Excel must have clearly labeled columns/rows (including units), and graphs must have a title, an explanation block, and axis labels

with proper units. Mislabeled graphics will result in reduced scores. Excel spreadsheets and Python code may require written documentation (in Word) of how the spreadsheet works, conclusions drawn from the computations, discussion of limitations in the spreadsheet, suggested embellishments to the spreadsheet, and so forth.

Homework problems that require derivations, sketches, and simple calculations would normally be hand written and submitted on paper.

### **Course Grade:**

Final grades will be based on the following percentage ranges: 100-90% A, 89-80% B, 79-70% C, 69-60% D, 59% and below F. **All exams and submitted materials will be counted in determining the final grade in the course, and attendance and in-class participation will be considered.** The weighting of daily/weekly assignments and examinations to determine the final grade is:

#### % of Final Grade

10.0	Homework assignments and participation
30.0	Gravity/magnetics exam
30.0	Electrical/electromagnetics exam
<u>30.0</u>	<u>Final exam</u>
100.0	% of total

Plus and minus grade modifiers may be inserted on final grades at the instructor's discretion.

### **Exams:**

Exams will cover all material delivered in lecture, assigned as readings, or completed as homework, including derivation of equations. Exams may include questions that request sketches of mathematical functions, flow charts of processes, circuit diagrams, sketches of mechanical systems, or the extraction of information from graphs.

Exam style may vary among the three exams, i.e., one might be all derivations, and another might be all short answers and diagrams.

No electronic resources, including calculators, may be used during exams. Slide rules may be used for calculations. Any attempt to use a calculator, smartphone, tablet, laptop, or similar devices will result in termination of the exam for the offending student.

The final exam will cover, primarily, seismic and radar methods. However, some seismic and radar topics relate to material presented earlier in the course, and questions on those earlier topics may be asked.

The first two exams will be limited to 50 minutes, i.e., 3:10 pm to 4:00 pm. Students are free to leave after their respective examination papers are submitted. At 4:05 pm, the exam will be reviewed. Attendance at the exam review is optional. These reviews will be the only class time devoted to review of the exam questions. Students who do not participate in the exam reviews should not expect explanations of answers during a visit with the instructor.

The final exam period will be the full two hours as scheduled by the University.

Exam scores, generally, are shifted in some way in an attempt to keep scores in the range of 60-100 points. Grades will be posted in Moodle.

**Student Conduct Code:**

Students are expected to be familiar with the Student Conduct Code. It outlines the rights and responsibilities of students at The University of Montana. Being a student at UM presupposes a commitment to the principles and policies embodied in the Code. The Code can be found at the website of the Vice President for Student Affairs ([http://www.umt.edu/vpsa/policies/student\\_conduct.php](http://www.umt.edu/vpsa/policies/student_conduct.php)).

Of significance for this course is that independent work is expected on every homework assignment, and, of course, during exams. The course does not have any group projects. Specific activities that compromise the sense of independent work are listed in part V.A.2 of the Code. Part V.A.1 addresses plagiarism, which will also be considered in reviewing any submitted materials. As noted above, certain resources are not to be used during exams, and this issue is addressed in the code (V.A.2).

**Disability Accommodations:**

Students with disabilities will receive reasonable accommodations in this course. To request accommodation, please contact the instructor as soon as possible. The instructor will work with Disability Services in the accommodation process. For more information, visit the Disability Services website at <http://life.umt.edu/dss> or call 406-243-2243 (Voice/Text).