

**ES302 QUANTITATIVE METHODS
POLICIES AND PROCEDURES**

Winter 2009 Term - Western Oregon University
2 CR Natural Sciences Bldg, Rm 218

INSTRUCTOR: Dr. S. Taylor
OFFICE HOURS: T 2-4 PM, W 12-1 PM, Phone: (w) 838-8398 (cell) 541-760-9216
F 2-4 PM, By Appointment e-mail: taylors@wou.edu
OFFICE: RM 210/NS104 Natural Sciences Bldg
Web Site: www.wou.edu/taylor

COURSE DESCRIPTION:

Class focuses on quantitative techniques in geology, applied mathematics, basic statistics, software applications, technology integration and field mapping techniques. Three hours of active learning per week. Additional field trips outside of scheduled class time may be required. PREREQ: Introductory Geology course, or consent of instructor. May be taken concurrently with introductory geology course.

THE PROFESSOR'S PHILOSOPHY ON UPPER DIVISION EARTH SCIENCE / GEOLOGY COURSES:

The upper division Earth Science / Geology course sequence is designed for mature, serious students who are willing to work hard, play hard, have fun, and learn in-depth skills / concepts in a professional academic setting. By default, our student population is very diverse with a wide array of skills, interests, and career goals. The student population ranges from serious Earth Science majors with focused career objectives, to Geology / Earth Science minors to Geography and Science Education majors. As such, the professor is charged with serving a diverse array of student interests and career goals in the most professional manner possible. The problem-solving and technical skills acquired via training in the Earth Sciences are highly valuable (and marketable), regardless of career track. Students are expected to actively participate in the learning process and make a significant contribution to the academic integrity of the Earth Science program at Western Oregon University. The ultimate goal of the program is to provide graduates with the academic skills that will enable them to be highly competitive in graduate school or the career marketplace. *GO TEAM!*

REQUIRED TEXTS:

Waltham, D., 2000, Mathematics – A Simple Tool for Geologists, 2nd Edition: Blackwell Science, 201 p.
(We will be working problems out of this book, you must have access to this book.)**

ADDITIONAL READING:

Tutorials, journal articles, and text readings to be provided by the instructor.
Downing, D., 1988, Calculus the easy way: Barron's Educational Series, Inc.
Davis, J.C., 1986, Statistics and data analysis in geology, 2nd ed., Wiley,
Grossman, S.I., 1989, Algebra and Trigonometry: Saunders Publishing

CLASS NOTES:

A comprehensive set of instructor class notes are available for download via the internet. The class web site is at URL <http://www.wou.edu/taylor> ... and follow the links to the "ES302" home page. The class notes are available as Adobe Acrobat Reader files (*.pdf file). Acrobat Reader is free and is installed on many campus PC's. For home installation, Acrobat Reader is also available for download at the class web site, but you will be responsible for properly installing the software (and will do so at your own risk!).

Based on prior student suggestions, I have assembled my class notes and made them available. These notes may be freely printed at any campus internet station (e.g. ITC Bldg - Student Lab, Library, local department computer labs). The notes are in outline form and are very comprehensive. "Exam Study Guides" will also be posted on the web site as the term progresses.

EVALUATIONS AND EXPECTATIONS:

Student performance will be evaluated on the basis of quizzes (pop quizzes, mid-term, final), class/lab exercises, and weekly attendance/class participation. The following is a breakdown of evaluation points, dates, and letter grades:

Pop Quiz 1	15 pts
Midterm Quiz 1	35 pts
Pop Quiz 2	15 pts
Final Quiz 2	40 pts
Class / Lab Exercises	100 pts
Weekly Class Participation	30 pts

TOTAL: 235 pts
Final Grading Scale

Percent Range of Total Points	Letter Grade	Percent Range of Total Points	Letter Grade
94-100%	A	77-79%	C+
90-94%	A-	73-76%	C
87-89%	B+	70-72%	C-
83-86%	B	67-69%	D+
80-82%	B-	63-66%	D
		60-62%	D-
		<60%	F

Quizzes: Quizzes will largely consist of homework-type problems with an emphasis on practicum-style demonstration of skills developed each week. Pop quizzes will be administered prior to midterm quiz 1 and final quiz 2, respectively.

Make-Up Quizzes: Under NO circumstances will make-up quizzes be administered without prior arrangement (at least five days) and good reason. Please show up on quiz day!

Weekly Class Participation: ES302 is a methods course that emphasizes hands-on activities and skill building. It is not a traditional "lecture" course, but one in which students are expected to actively engage active learning modules with their peers and instructor. Successful completion of the course is based on in-class student participation and collective interaction. As such, student work activities and progress will be checked at the end of each three-hour class period. Students will be assigned weekly lab activities with a short introduction and overview of required methodology. Progress on weekly assignments will be assessed at the end of each class period, beginning in the last 20 minutes of class. Assessment will involve one-on-one debriefing with the instructor and clear demonstration of student achievement. Three points per week are available to students who demonstrate adequate weekly progress on their in-class assignments (a total of 40 points for the term). Students who are absent or leave class prior to the last 20 minutes of the class without instructor assessment will receive a "zero".

Class and Lab Assignments: Class and lab assignments will be worked BOTH during class time and outside of class time each week. You will have lab, reading, and homework assignments that **may** take up to 3 or 4 hours to complete outside of class time, maybe more in some cases, depending on your skill levels and ability. Please plan your schedule accordingly. Due dates for class exercises will be prescribed by the instructor. Late work will be accepted up to 1 week after the due date, but will be automatically assessed a penalty of -20% of the point total.

Due to the volume of students assigned to the instructor each term, he will not be able to grade the lab exercise work in detail. The homework and lab assignments will be checked for completeness, with questions randomly chosen for content and accuracy. Grade points will be assigned on the basis of these two criteria. Exercise

answer keys will be posted on the class web site by the instructor. **It is your responsibility to: (1) check your work against the lab / homework keys, (2) make sure you understand how to complete the exercises, (3) find help if you have trouble with lab exercises, and (4) study / learn the exercise skills and material for the exams.**

A NOTE ABOUT INCOMPLETES: No incomplete grades will be given during the last week of class. If you have a problem that warrants an incomplete, make arrangements prior to the last week (no exceptions!!).

A NOTE ABOUT LOST OR MISSING WORK

The instructor will only grade work that is received and physically visible. Any missing work (lab assignments, homework, quiz/test answer sheets) will receive a "0" on the grade sheet. This policy applies to work lost by the student or instructor. If the student demonstrates that the work was turned in, but is missing due to the instructor's incompetence, then the student will be afforded an opportunity to make up the work and resubmit it for graded credit. Otherwise, the student will not receive credit for lost or missing work.

CHANGE OF SYLLABUS - POP QUIZZES - UNANNOUNCED HOMEWORK ASSIGNMENTS

The instructor reserves the right to modify the syllabus and class schedule at any time during the term. Students will be notified of such changes in a timely manner. The instructor also reserves the right to administer pop-quizzes and assign unscheduled homework / class assignments at any time. All students will be responsible for completing this work and it will comprise part of the final class grade.

FIELD TRIP(S):

Local field trips and field exercises may be scheduled during the term as time permits. Some of these field trips will be around campus and spontaneously planned. Please wear/bring appropriate outdoor clothing (boots, raincoat, etc) for field activities during class time. Also be aware that additional scheduling and personal time may be required as the course develops.

STUDENT HONOR POLICY:

Plagiarism and cheating will not be tolerated. Cheating includes copying others work, cutting-and-pasting computer results, and using cheat sheets on exams. However, students are encouraged to interact in small groups during class assignments, i.e. you can freely discuss concepts in all portions of the class, except exams. Students ARE NOT permitted to photo copy or cut-and-paste peer work. If you work on labs together, complete your own work independently and print out your own results in a format that differs from your colleagues. If you directly copy or cut-and-paste another student's work, you and your collaborator will receive a "0" for the exercise.

OTHER REQUIRED MATERIALS:

Students will also need access to a scientific calculator, colored pencils, ruler, and protractor. You will be required to use these materials during lecture, lab, and exams. Please plan accordingly, or you will have trouble successfully completing the class.

STUDENTS WITH DISABILITIES:

Any student who has a disability that requires accommodation, please make an appointment to see me.

A NOTE ABOUT THE LAST WEEK OF CLASS:

Given that the Oregon University System employs the "quarter method" of academic scheduling, upper division courses are by nature "compressed" with much detailed information to cover in a relatively short period of time. Please note that most upper division text books are geared for courses at universities with a 16 week semester system (i.e. we are truly trying to pack 10 pounds of equations into a 5 pound calculator). As such, the 10th week of class is as critical to content coverage as the 1st week. Students should anticipate a full slate of "normal" activities during the last week of class, including lectures, lab exercises, written reports, etc. The class is not over until after the final exam! **Plan your schedule accordingly!**

A NOTE ABOUT COMPUTER-BASED COURSES:

This class will use technology, hardware, software, and the campus network. As such, there are endless possibilities for software glitches, system failure, and total confusion. Your patience with lab exercises, assignments, course content, and software / hardware glitches will be greatly appreciated. **Our motto for this term: "expect the worst and hope for the best".**

TENTATIVE CLASS SCHEDULE: This outline should be considered tentative at best. The following schedule may be modified as class ideas evolve throughout the term.

<u>Week</u>	<u>Dates</u>	<u>Class Content</u>	<u>Class Exercises</u>	<u>Readings</u>
1	Jan. 5, 9	Class Policies, Introduction, Math/Algebra Review, Unit Conversions, Linear Equations	In-Class: Unit Algebra; HW1 – Intro to Geologic Problem Solving	Waltham Chap 1; Chap 2 – p. 17-24
2	Jan. 12, 16	Mapping and Surveying; Brunton Compass Surveying	Campus Tape and Compass Survey	Compton's Manual (web reading)
3	Jan. 23	Functions and Geologic Variables, Intro to Excel	Excel Tutorial HW2 – Geologic Variables	Waltham Chap 2; Grossman Handouts
No Class Monday Jan. 19, MLK Day. Be Prepared for Pop Quizzes on Friday of this week.				
4	Jan. 26, 30	Intro to Trig./Strike-Dip Manipulating and Simplifying Equations	HW3 – Equation Manipulation In-Class Strike-Dip Exercise	Whaltham, Ch 3-4 Compton's Manual (web reading)
5	Feb. 2,6	Graphing Techniques, Grapher Software; Trig. Applications to Geology	In-Class: Grapher Tutorial HW4 – Trig Applications	Waltham Chap 5
Quiz 1 – week 5; Midterm Lab Portfolio Due week 5				
6	Feb. 9, 13	Grapher (Cont.) Surfer – I	In-Class: More Graphing, Ternary Diagrams	Waltham Chap 6
Friday Feb. 13, Last Day to Drop Without Grade Penalty				
7	Feb. 16, 20	Working with maps and spatial data; Surfer II	In-Class: Surfer Tutorial; Using Surfer to Create Digital Maps	Class Notes
8	Feb. 23, 27	Intro to Geostatistics, Excel as a Stat. Tool	In-Class: Excel Statistics HW5: Statistical Analysis of Hillslope Gradients	Waltham Chap 7 Davis Ch 1-2
Be Prepared for Pop Quizzes				
9	Mar. 2, 6	Rockworks Software, Intro to Final Project	In-Class: Rockworks Tutorial	Class Notes
10	Mar. 9, 13	Final Project/Take-Home	Final Project	Class Notes
Quiz 2 –week 10				
11	Mar 16-20	Finals Week – Final Project and Lab Portfolio Due Monday Mar. 16		

In a neat, professional-looking package (3-ring binder) that is well labeled, include the following class activities, in the prescribed order:

(1) Intro to Unit Algebra Worksheet

http://www.wou.edu/las/physci/taylor/g302/unit_alg.pdf

(2) Intro to Map Scales

<http://www.wou.edu/las/physci/taylor/g302/mapscale.pdf>

(3) Intro to Topographic Maps (Monmouth Quad)

http://www.wou.edu/las/physci/taylor/g302/intro_map_ex.pdf

(4) Soil Map / Scale Exercise

http://www.wou.edu/las/physci/taylor/g302/map_photo_scale_ex.pdf

(5) Map Measurement and Location Exercise

http://www.wou.edu/las/physci/taylor/g302/map_measurement_exercise.pdf

(6) Student Pace and Ocular Height Determination

http://www.wou.edu/las/physci/taylor/g302/Pace_Ocular_height_worksheet.pdf

(7) Watershed Delineation / Planimeter Exercise

http://www.wou.edu/las/physci/taylor/g302/watershed_delineation_drainage_area_exercise.pdf

(8) Campus Surveying / Compass Exercise

http://www.wou.edu/las/physci/taylor/g302/brunt_lab.pdf

(9) Classroom Scaling / Base-map Project

http://www.wou.edu/las/physci/taylor/g302/class_map_exercise.pdf

(10) In-Class Strike and Dip / Trig-Mapping Exercise

http://www.wou.edu/las/physci/taylor/g302/trig_map_ex.pdf

(11) Introduction to Triangulation Exercise

http://www.wou.edu/las/physci/taylor/g302/intro_triangulation.pdf

(12) Three-point Topo map problem (Coal Bed Strike/Dip Problem)

http://www.wou.edu/las/physci/taylor/g302/three_pt.pdf

Total Points Possible: 50

13 Waltham Chapter 5 – Trigonometric Applications to Geologic Problems

14 Surfer Tutorial (http://www.wou.edu/las/physci/taylor/g302/surf_tut1.pdf)

Demo Contour Map (data, grid, map)
 Demo Contour Map with Color Fill
 Demo Wireframe Map
 Demo Wireframe with Color Fill Zones
 Demo Post / Contour Map Overlay
 Demo 3D Surface Map

15 Using Surfer to Create Elevation Models (<http://www.wou.edu/las/physci/taylor/g302/surfdem.pdf>)

DEM / contour map of Monmouth quad
 Marys Peak Contour Map
 Marys Peak Shaded Relief
 Marys Peak Vector
 Marys Peak Contour / Vector Overlay
 Hometown quad contour map
 Hometown quad shaded relief
 Hometown vector map
 Hometown quad contour / vector overlay

16 Intro to Contouring and DEMs (http://www.wou.edu/las/physci/taylor/g302/intro_contouring_dem.pdf)17 Grapher Tutorial (http://www.wou.edu/las/physci/taylor/g302/grph_tut.pdf)

Scatter plot / line plot
 Scatter plot / point modification
 Scatter plot with labels
 Scatter plot with lines, points, labels
 Combination Line / Bar Graph

18 Waltham Text Triangular Graphs / Rock Composition Problem

Waltham Ternary Plot Exercise (7 plots of petrologic chemistry data)

19 Application Ternary Diagrams to Sandstone (<http://www.wou.edu/las/physci/taylor/g302/ternary.pdf>)

QFL Data renormalization / hand plot
 Grapher QFL Diagram

20 Intro to Excel Data Analysis (http://www.wou.edu/las/physci/taylor/g302/Intrexcl_ver2.pdf)21 Integrated Final Project (http://www.wou.edu/las/physci/taylor/g302/final_project_w07.pdf)

- Task 1 Mt. Bachelor Contour Map 10-f
 Mt. Bachelor Contour Map 20-f
 Mt. Bachelor Shaded Relief 335 sun azimuth
 Mt. Bachelor Shaded Relief 200 sun azimuth
 Mt. Bachelor Wireframe
 Mt Bachelor Contour/Vector Overlay
 Bachelor Butte USGS 10-m DEM Shaded Relief Map (scaled w/north arrow)
 Bachelor Butte USGS DRG Base Map (scaled w/ north arrow)
- Task 2 Rose Diagram / fracture data
- Task 3 – Appalachian Morphometry Exercise
 X-Y Plot of Drainage Area (y axis) vs. Slope (x axis) Fernow Area (with linear regression)
 X-Y Plot of Drainage Area (y axis) vs. Slope (x axis) North Fork Area (with linear regression)
 X-Y Plot of Drainage Area (y axis) vs. Slope (x axis) Little River Area (with linear regression)
 X-Y Plot of Valley Width (y axis) vs. Distance from Divide (x axis) Fernow Area (with linear regression)
 X-Y Plot of Valley Width (y axis) vs. Dist. From Divide (x axis) North Fork Area (with linear regression)
 X-Y Plot of Valley Width (y axis) vs. Dist. From Divide (x axis) Little River Area (with linear regression)
 Rose Diagram of Hillslope Aspect Fernow Area
 Rose Diagram of Hillslope Aspect North Fork Area
 Rose Diagram of Hillslope Aspect Little River Area
 Polar Plot of Slope Gradient vs. Aspect Fernow Area
 Polar Plot of Slope Gradient vs. Aspect North Fork Area
 Polar Plot of Slope Gradient vs. Aspect Little River Area
 X-Y Plot of Slope Length (y axis) vs. Hillslope Gradient (x axis) Fernow Area (with linear regression)
 X-Y Plot of Slope Length (y axis) vs. Hillslope Gradient (x axis) North Fork Area (with linear regression)
 X-Y Plot of Slope Length (y axis) vs. Hillslope Gradient (x axis) Little River Area (with linear regression)
 Hillslope Statistical Summary Data
- Task 4 – Newberry Cone Analysis
 Cone Distance between cone 1 and cones 2-296
 Cone Azimuth between cone 1 and cones 2-296

22 Optional: Alluvial Fan Lab (<http://www.wou.edu/las/physci/taylor/g302/fanex2.pdf>)