ES302 QUANTITATIVE METHODS
POLICIES AND PROCEDURES
Spring 2015 Term - Western Oregon University
2 CR Natural Sciences Bldg, Rm 218, Wed. 1-2 PM, Fri. 1-3 PM

INSTRUCTOR: Dr. S. Taylor
OFFICE HOURS: T-R 12-2 PM
By Appointment

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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!*

OPTIONAL 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)

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	45 pts
Pop Quiz 2	25 pts
Final Quiz 2	70 pts
Class / Lab Exercises	135 pts
Weekly Class Participation	10 pts
TOTAL:	300 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 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 spot checked at the end of select class periods. Students will be assigned weekly lab activities with a short introduction and overview of required methodology. Assessment will involve one-on-one debriefing with the instructor and clear demonstration of student achievement. Class participation points are available to students who demonstrate adequate weekly progress on their in-class assignments.

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.**

Learning Resources and Grade Outcomes: The class knowledge base will be derived from a combination of the following: (1) independent student reading outside of class; (2) independent student engagement of take-home lab exercises and quantitative problem solving; (3) independent student reading of web resources linked from the class web site; (4) systematic review and memorizing of class notes and ancillary reading materials, as directly linked from class web site and handed out in hard copy during class time; and (5) successful attendance, note taking, and engagement of in-class lectures delivered by the instructor. Instructor lectures are designed as interpretive translations to assist students in understanding the class content and to stay on track with the weekly schedule. Lectures are not intended as the primary knowledge transfer mechanism. Independent student engagement of readings, class notes and lab work outside of class time is the most important pathway to success.

DIGITAL LAB REPORTS: Weekly lab exercises represent a significant component of the class. Exercises are based on scientific observation, data analysis, and problem solving. Students will compile a Digital Lab Report consisting of a well-organized Acrobat *.PDF file containing completed lab exercises. Students will complete approximately one (1) long-format lab exercise per week of the term, multiple short-format "in-class" exercises, and reading/field trip summaries. Some of the completed work will be in digital format that can easily converted to a *.PDF file directly using Windows 7 tools or Creative Suite Adobe Acrobat software available in the NS218A computer lab. Other lab work that is completed by hand/pencil/paper will be digitally captured by students using scanners in the NS218A computer lab or other available resources on campus. All individual lab exercises and summaries will be converted to PDF formats and combined with the others in the prescribed order, and assembled into one, single, merged PDF Digital Lab Report and uploaded to the Moodle Online Class Management System (moodle.wou.edu). Portfolio checklists will be provided before the midterm and final times, so that students can organize, assemble and label their portfolio sections in an orderly manner. The order of portfolio sections must follow the assigned check list!

Digital Lab Reports will be graded once at Midterm and once at Final time. A total of **five** Moodle upload submissions will be scheduled at even increments throughout the term: Week 2 Moodle Test Upload, Week 3 Lab Progress Report 1, Week 6 Midterm Lab Report, Week 8 Lab Progress Report 2, and Week 11 Final Lab Report. Lab progress reports 1 and 2 are designed to provide a scheduling framework for students to work towards formal submission of the Midterm and Final Lab Reports, respectively. Lab progress reports and final reports will be checked for completeness at the prescribed due dates. An exercise task-list will be maintained as assignments evolve throughout the term. It is important to complete assignments on schedule, as they are designed to help students understand lecture concepts and aid in successfully achieving positive results on the exams.

Special Note: ***Do not use the Adobe Acrobat "Assemble Portfolio" tool.*** This tool appends all of the PDF documents as separate sub-files in random order. When combining PDF documents, the result should be one seamless PDF file, in the order prescribed, with no additional sub-menu management necessary. Any "Adobe Acrobat Portfolios" submitted in the improper format will be returned without grade for subsequent correction and resubmission.

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".**

INSTRUCTOR TIMELINE FOR GRADING EXAMS AND LAB MATERIALS:

The instructor's class grades are due the Tuesday after final's week. All exams, lab materials, and assignments submitted by students throughout the term will be graded by that time, however the professor will make an effort to return graded materials within two weeks of the assigned due date.

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

Week	Dates	Class Content	Class Exercises	Readings
1	Apr. 1, 3	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	Apr. 8, 10	Mapping and Surveying; Brunton Compass Surveying	Campus Tape and Compass Survey	Compton's Manual (web reading)
	Moodle Test Upload Due by Friday April 10, 11 PM			
3	Apr. 15, 17	Functions and Geologic Variables, Intro to Excel	Excel Tutorial HW2 – Geologic Variables	Waltham Chap 2; Grossman Handouts
	Be Prepared for Pop Quizzes on Friday of this week. **Moodle Upload, Lab Progress Report 1, Due by Friday April 17, 11 PM**			
4	Apr. 22, 24	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	Apr. 29, May 1	Graphing Techniques, Grapher Software; Trig. Applications to Geology	In-Class: Grapher Tutorial HW4 – Trig Applications	Waltham Chap 5
	Quiz 1 – Week 5			
6	May 6, 8	Grapher (Cont.) Surfer – I	In-Class: More Graphing, Ternary Diagrams	Waltham Chap 6
	Moodle Upload, Midterm Lab Report, Due by Friday May 8, 11 PM **Friday May 8, Last Day to Drop Without Grade Penalty**			
7	May 13, 15	Working with maps and spatial data; Surfer II	In-Class: Surfer Tutorial; Using Surfer to Create Digital Maps	Class Notes
8	May 19	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
	NO CLASS FRIDAY MAY 22 – MEMORIAL DAY WEEKEND; Be Prepared for Pop Quizzes **Moodle Upload, Lab Progress Report 2, Due by Friday May 22, 11 PM**			
9	May 27, 29	Rockworks Software, Intro to Final Project	In-Class: Rockworks Tutorial	Class Notes
10	June 3, 5	Final Project/Take-Home	Final Project	Class Notes
11	Week of June 8 Finals Week Check Schedule **Moodle Upload, Final Project / Lab Report, Wed. June 10, 11 PM**			

Example Midterm Lab Portfolio – Tentative Checklist, subject to modification / TBD

(1) Online Excel Tutorial (print out of results)
http://www.wou.edu/las/physci/taylor/g302/excel/excel.html

(2) Map Measurements Using Engineers Scale (part 1)
http://www.wou.edu/las/physci/taylor/g302/engineer-architect-scales.pdf

(3) Unit Algebra Exercise
http://www.wou.edu/las/physci/taylor/g302/unit_alg.pdf

(4) Intro to Map Scales
http://www.wou.edu/las/physci/taylor/g302/mapscale.pdf

(5) Intro to Topo Maps (Monmouth Quad)
http://www.wou.edu/las/physci/taylor/g302/intro_map_ex.pdf

(6) Map Scale Problem (part 2- air photo scaling problem)
http://www.wou.edu/las/physci/taylor/g302/map_photo_scale_ex.pdf

(7) Map Measurement Using Protractor / Engineering Scale
http://www.wou.edu/las/physci/taylor/g302/map_measurement_exercise.pdf

(8) Student Worksheet (pace and ocular height measurement)
http://www.wou.edu/las/physci/taylor/g302/Pace_Ocular_height_worksheet.pdf

(9) Classroom Mapping Exercise
http://www.wou.edu/las/physci/taylor/g302/class_map_exercise.pdf

(10) Watershed Delineation and Drainage Area Measurement
http://www.wou.edu/las/physci/taylor/g302/watershed_delineation_drainage_area_exercise.pdf

(11) Intro Problem Set – Geologic Problem Solving (Text Chapter 1)
http://www.wou.edu/las/physci/taylor/g302/waltham1.pdf

(12) Intro to Excel / Spreadsheets (part 2)
http://www.wou.edu/las/physci/taylor/g302/Intrexcl_ver2.pdf

(13) Campus Tape and Compass Mapping Exercise
http://www.wou.edu/las/physci/taylor/g302/brunt_lab.pdf

(14) Introduction to Triangulation Exercise
http://www.wou.edu/las/physci/taylor/g302/intro_triangulation.pdf

Example Final Lab Portfolio – Tentative Checklist, subject to modification / TBD

In-Class Trig Map / Strike-Dip Exercise

Three Point Problem (Pittsburgh Coal)
Waltham Chapter 5 – Trigonometric Applications to Geologic Problems
Didger Software and Image Processing Tutorial (http://www.wou.edu/las/physci/taylor/g302/didger_4_tutorial.pdf)
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
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
Intro to Contouring and DEMs (http://www.wou.edu/las/physci/taylor/g302/intro_contouring_dem.pdf)
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
Waltham Text Triangular Graphs / Rock Composition Problem
Waltham Ternary Plot Exercise (7 plots of petrologic chemistry data)
Application Ternary Diagrams to Sandstone (http://www.wou.edu/las/physci/taylor/g302/ternary.pdf)
QFL Data renormalization / hand plot
    Grapher QFL Diagram
21 Integrated Final Project (http://www.wou.edu/las/physci/taylor/g302/final_project_w07.pdf)
Task1 Mt. Bachelor Contour Map 10-ft
        Mt. Bachelor Contour Map 20-ft
        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
    Hillslope Statistical Summary Data