TRIAL COURSE OR NEW COURSE PROPOSAL

SUBMITTED BY:

Department	GPMSL	College/School	SFOS
Prepared by	Arny Blanchard	Phone	474-1123
Email Contact	alblanchard@alaska.edu, clneumann@alaska.edu	Faculty Contact	Arny Blanchard

1. ACTION DESIRED

(CHECK ONE): Trial Course [X]   New Course [ ]

2. COURSE IDENTIFICATION: Dept **MSL** Course # **494** No. of Credits **3**

Justify upper/lower division status & number of credits: Upper-level coursework in biological and ecological processes will be necessary to fully appreciate the application of statistics to biological studies.

3. PROPOSED COURSE TITLE: Data Analysis for Marine Scientists

4. CROSS LISTED? YES/NO **Yes** If yes, Dept: **FISH** Course # **494**
(Requires approval of both departments and deans involved. Add lines at end of form for such signatures.)

5. STACKED? YES/NO **No** If yes, Dept. [ ] Course # [ ]

6. FREQUENCY OF OFFERING: **Every Spring**
(Every or Alternate) Fall, Spring, Summer — or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING (if approved) **Spring 2011**

8. COURSE FORMAT:

NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, any core course compressed to less than six weeks must be approved by the core review committee.

COURSE FORMAT: (check one)	1	2	3	4	5	X	6 weeks to full semester
OTHER FORMAT (specify)							
Mode of delivery (specify lecture, field trips, labs, etc)	Lecture and lab						

9. CONTACT HOURS PER WEEK: **2** LECTURE hours/weeks **3** LAB hours/week [ ] PRACTICUM hours/week

Note: # of credits are based on contact hours. 800 minutes of lecture=1 credit. 2400 minutes of lab in a science course=1 credit. 1600 minutes in non-science lab=1 credit. 2400-4800 minutes of practicum=1 credit. 2400-8000 minutes of internship=1 credit. This must match with the syllabus. See http://www.uaf.edu/uafgov/faculty/cd/credits.html for more information on number of credits.

OTHER HOURS (specify type) [ ]

10. COMPLETE CATALOG DESCRIPTION including dept., number, title and credits (50 words or less, if possible):

MSL 494, Practical Statistics for Marine Biologists, 3 cr.

Practical statistics for marine scientists is a survey of statistical methods commonly used in marine research. Topics include using Excel for data handling, data acquisition and visualization, exploratory data analysis, linear models, multivariate methods, and nonparametric techniques. Coursework will be computer-based using free statistical software and centered around marine environmental data sets.

SENT 9/8/10

11. COURSE CLASSIFICATIONS: (undergraduate courses only. Use approved criteria found on Page 10 & 17 of the manual. If justification is needed, attach on separate sheet.)

H = Humanities [ ] N = Natural Science [X] S = Social Sciences [ ]

Will this course be used to fulfill a requirement for the baccalaureate core? [ ] YES [X] NO

IF YES, check which core requirements it could be used to fulfill:

O = Oral Intensive, Format 6 [ ] W = Writing Intensive, Format 7 [ ] Natural Science, Format 8 [ ]

12. COURSE REPEATABILITY:

Is this course repeatable for credit? [ ] YES [X] NO

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time). [ ]

How many times may the course be repeated for credit? [ ] TIMES

If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course? [ ] CREDITS

13. GRADING SYSTEM:

LETTER: [X] PASS/FAIL: [ ]

RESTRICTIONS ON ENROLLMENT (if any)

14. PREREQUISITES STAT 200 or equivalent coursework, upper division biology or ecology courses.

These will be *required* before the student is allowed to enroll in the course.

RECOMMENDED Undergraduate marine biology or fisheries courses.

Classes, etc. that student is strongly encouraged to complete prior to this course.

15. SPECIAL RESTRICTIONS, CONDITIONS None.

16. PROPOSED COURSE FEES $0

Has a memo been submitted through your dean to the Provost & VCAS for fee approval? Yes/No [ ]

17. PREVIOUS HISTORY

Has the course been offered as special topics or trial course previously? Yes/No [No]

If yes, give semester, year, course #, etc.: [ ]

18. ESTIMATED IMPACT

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

A smart classroom will be required and is available at SFOS. No tenure-track faculty are available within the Institute of Marine Science with the expertise in statistics to teach this class. The dean supports a research faculty teaching this class. Students will be expected to provide a laptop for data analysis and a few laptops will be available for loan through GPMSL. There are no unusual demands for space, time, or budget to meet the needs of this class.

19. LIBRARY COLLECTIONS

Have you contacted the library collection development officer (ffklj@uaf.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No [ ] Yes [X] Emailed 6/11/10. Karen Jensen responded and sent me links to resources including the eres system which I use. I'm familiar with the resources for the topic of this class and the library collections are excellent including journal articles and laptops for checkout.

20. IMPACTS ON PROGRAMS/DEPTS

What programs/departments will be affected by this proposed action?

Include information on the Programs/Departments contacted (e.g., email, memo)

The course topics include statistics and biology. I contacted the Statistics department by email and no concerns were expressed. I met with Rich Boone, dept. head of biology 5/2010, and he indicated that there may be a positive response as this course could be of interest for their students as well.

21. POSITIVE AND NEGATIVE IMPACTS

*Please specify **positive and negative** impacts on other courses, programs and departments resulting from the proposed action.*

This course will fill a need for upper level marine biology and fisheries students and graduate students in computer technology and data analysis. A similar course is not offered for science students and indications are that it will be greatly appreciated. Positive impacts include filling the need for this course content to science students (Biology and Wildlife, Fisheries, and Marine Science students). Some marine science students taking this course may choose to not take regression (STAT401) but statistics courses are not required for the graduate program in marine sciences. Thus, negative impacts are not expected for other courses or programs as this course is intended to bridge the sometimes difficult gap for marine biologists between elementary statistics and other courses like STAT401, STAT402, BIO680, or FISH631.
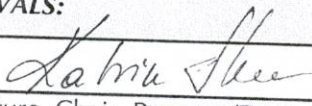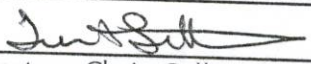
JUSTIFICATION FOR ACTION REQUESTED

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. Use as much space as needed to fully justify the proposed course.
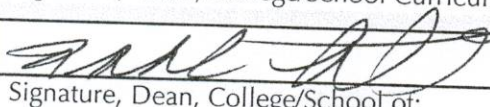
Graduating science students at UAF and incoming graduate students are often weak in computer and statistical skills. These are skills needed to be successful in research or management opportunities. Thus, this class will fill a need for a bridge course between Elementary Statistics (STAT 200) and higher level courses like linear regression (STAT 401), scientific sampling (STAT 402), and data analysis in biology (BIO 680). Students will gain needed skills in using computing technology (Excel) for data acquisition and statistical analysis and visualization. This course is intended to provide them tools for research that can enhance their success in their academic and professional work.

Unlike other statistical classes, this class will integrate computer programs that they will encounter in the workplace with learning how to correctly apply statistical tools to research questions. Student learning is often greater when they can work with data and examples from their own field of interest. This is particularly true for biologists whom often struggle when taught statistics without biological examples or understanding how the procedures they learn are related to their research questions. With this in mind, this class will be designed around a variety of biological and environmental data sets collected from the marine environment.

APPROVALS:

		Date	31 Aug 10
Signature, Chair, Program/Department of:	GPMSL		

		Date	08/31/20.0
Signature, Chair, College/School Curriculum Council for:	SFOS		

		Date	9/1/10
Signature, Dean, College/School of:	SFOS		

	Date	
Signature of Provost (if applicable)		

Offerings above the level of approved programs must be approved in advance by the Provost.

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

	Date	
Signature, Chair, UAF Faculty Senate Curriculum Review Committee		

ATTACH COMPLETE SYLLABUS (as part of this application).

Note: syllabus must follow the guidelines discussed in the Faculty Senate Guide http://www.uaf.edu/uafgov/faculty/cd/syllabus.html. The department and campus wide curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items are missing or unclear, the proposed course change will be <u>denied</u>.

SYLLABUS CHECKLIST FOR ALL UAF COURSES

During the first week of class, instructors will distribute a course syllabus. Although modifications may be made throughout the semester, this document will contain the following information (as applicable to the discipline):

1. **Course information:**
   ❏ Title, ❏ number, ❏ credits, ❏ prerequisites, ❏ location, ❏ meeting time (make sure that contact hours are in line with credits).

2. **Instructor (and if applicable, Teaching Assistant) information:**
   ❏ Name, ❏ office location, ❏ office hours, ❏ telephone, ❏ email address.

3. **Course readings/materials:**
   ❏ Course textbook title, ❏ author, ❏ edition/publisher.
   ❏ Supplementary readings (indicate whether ❏ required or ❏ recommended) and ❏ any supplies required.

4. **Course description:**
   ❏ Content of the course and how it fits into the broader curriculum;
   ❏ Expected proficiencies required to undertake the course, if applicable.
   ❏ Inclusion of catalog description is *strongly* recommended, and
   ❏ Description in syllabus must be consistent with catalog course description.

5. ❏ **Course Goals (general) and** ❏ **Student Learning Outcomes (more specific)**

6. **Instructional methods:**
   ❏ Describe the teaching techniques (eg: lecture, case study, small group discussion, private instruction, studio instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.).

7. **Course calendar:**
   ❏ A schedule of class topics and assignments must be included. <u>Be specific</u> so that it is clear that the instructor has thought this through and will not be making it up on the fly (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). You may call the outline Tentative or Work in Progress to allow for modifications during the semester.

8. **Course policies:**
   ❏ Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.

9. **Evaluation:**
   ❏ Specify how students will be evaluated, ❏ what factors will be included, ❏ their relative value, and ❏ how they will be tabulated into grades (on a curve, absolute scores, etc.)

10. **Support Services:**
    ❏ Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

11. **Disabilities Services:**
    The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials.
    ❏ State that you will work with the Office of Disabilities Services (208 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities."

MSL 494: Data Analysis for Marine Scientists

Instructor: Arny Blanchard

Office: O'Neill 127
Phone: 474-1123, Email: alblanchard@alaska.edu,
Office Hours: TBA.
Text: Quinn and Keough, Experimental Design and Data Analysis for Biologists.
Credits: 3 hrs (Lecture/Lab).
Course offering: Spring semester
Location and meeting time: TBA: Lecture/Lab format: MW 1 hr lecture, TH 3 hr lab.

Textbook:

GP Quinn, MJ Keough. Experimental design and data analysis for biologists. Cambridge.

Supplementary texts (not required): Everitt and Hothorn, A Handbook of Statistical Analyses
    Using R. Available as a PDF in the R library HSAUR2.

A student laptop is required.

Course Description:

Catalog Description: Practical statistics for marine scientists is a survey of statistical methods commonly used in marine research. Topics include using Excel for data handling, data acquisition and visualization, exploratory data analysis, linear models, multivariate methods, and nonparametric techniques. Coursework will be computer-based using free statistical software and centered around marine environmental data sets.

Data Analysis for marine scientists will introduce undergraduate students to statistical methods they will encounter in their professional career. Data analysis for marine scientists is a survey of methods applicable to marine research with a focus on the correct application of statistical methods to real data sets. Topics include using deciding which test to use, testing assumptions, Excel for data manipulation, exploratory data analysis, linear models (linear and logistic regression and one-way and multiway analysis of variance), multivariate methods (e.g., cluster analysis, canonical correspondence analysis, nonmetric multidimensional scaling, and principal components analysis), and nonparametric techniques (e.g., rank tests and categorical regression trees). Additional methods will be discussed as time allows. Homeworks will be computer-based using free statistical software. The course will provide students with the tools and understanding they need to be successful in managing and analyzing data encountered in the workplace as well as further academic studies.

The course will combine lectures with a computer lab (students provide their own laptop). Powerpoint will be used for lectures and lecture notes will be available as pdf files.

Prerequisites:

STAT 200 or equivalent and upper level biology or ecology courses. Expected proficiencies: understanding basic statistics, ability to use computer technology, familiarity with Microsoft

Excel or another spreadsheet program, and an understanding of general biological and ecological processes.

Course Objectives and Learning Outcomes:
This class will expand student skills in the application of statistics necessary for starting careers in research. The students will become familiar with the basic tools and processes for statistical analysis of biological data and understand how to critically evaluate data and test assumptions to perform the right test and draw correct inferences from their analyses. Students completing this class will learn how to:
1) use spreadsheets for data manipulation and data visualization,
2) decide which statistical procedures are appropriate,
3) diagnose assumptions of statistical tests,
4) correctly apply statistical tests, and
5) interpret output from statistical procedures.

Readings:
Most readings will be from the text but some additional papers will be assigned. Note that it is REQUIRED that you read the material for each lecture PRIOR to coming to class. As a result, lectures can focus on student questions and areas of uncertainty rather than lecturing on topics that students already know (an approach taken from the peer-instruction method). I anticipate asking questions via email or blackboard prior to class to which students will respond providing insights into the topics understood and those that are less clear.

Student Evaluation:
Success in the class will be measured by homeworks, quizzes, exams, and a project. Coursework will be evaluated based on these criteria:
1) Understanding of the statistical procedures applied, the context of the methods in biology, and test assumptions (20%).
2) Neatness of work and ability to summarize statistical procedures (20%).
3) Accuracy of work performed (20%).
4) Completeness of work performed (20%).
5) Adequacy of interpretation and conclusions drawn (20%).
6) On time (see note below).

Grade	Percentage	Points
A	90 and up	≥ 540
B	80 – 89	≥ 480 and < 540
C	70 – 79	≥ 420 and < 480
D	60 – 69	≥ 360 and < 420
F	Below 60	< 360

Tentatively, there will be 12 computer lab assignments/homeworks @ 10 pts., 4 quizzes @ 10 pts. covering assigned readings, 40 points for class and lab participation, a take-home/lab data analysis project as part of the final @ 100 pts, and three exams @ 100 pts each including the in-class final. The projected total points for the class is 600 points. The actual number of homeworks and quizzes will depend on the flow of the class and the amount of material covered.

Homeworks will cover applications of methods discussed, quizzes will cover assigned readings, and exams will seek to evaluate your learning by challenging your statistical decision-making abilities.

Homework

Homeworks will be computer based and are essential to passing the class. Homeworks are assigned on Thursday during lab and then collected the next Thursday. Homework must be legible and stapled. Homework turned in up to 1 class day late, the start of class Monday, will be docked 50%. Assignments turned in after that will be given no score. Exceptions to this rule will be granted if you become ill (proof may be required), have to travel for legitimate work purposes, etc. **Make every effort to turn your work in on time!** Students may work together, but you must write out your own assignment. Missed homeworks with a valid exception are due within 1 week of returning to class.

Copying of another student's homework (plagiarism) or ideas will not be tolerated. Science is collaborative so working together in this class to discuss and analyze data is encouraged but DO NOT copy another student's work or let someone else copy your work. Instructor options include giving a failing grade for the assignment, a failing grade for the class, or removal from the class.

Messy homeworks are difficult to grade and will lose points.

Class participation

I presume that each student is responsible for their time and actions. It is important to note, however, that failure to attend class will be reflected in your class grade by lower scores. Individuals not attending class regularly miss important information that is reflected as poor performance on tests, particularly on the final where information is cumulative. The grade you receive will depend on your effort in learning the material in class, class discussions, and on homework so be at class!

<u>Chronically late or 2 zero scores for homework assignments, very poor effort on assignments, or skipping an exam prior to the last drop/add date will result in a faculty withdrawal of the student.</u>

Talking in class, answering cell phones, reading books, or doing homework assignments are disruptive to the class. Class and lab participation points will be subtracted from your score if this becomes a problem.

Disruption of class by late students can be a problem so let's be ontime!

Quizzes and Exams

If you need to take a quiz or exam outside of the scheduled time, you must contact me in advance whenever possible or as soon as you can after missing a test for an acceptable reason (no, attending the Arctic Man is NOT an acceptable excuse). Make-up tests are usually more difficult than the original and should be taken within a week of the quiz or exam. A zero score will be given for missed quiz without a legitimate reason, missing a scheduled make-up, or failing to make the quiz up within the week. Quizzes will cover the discussion and lecture materials.

Every effort should be made to complete and exam as soon as possible but all homeworks should be completed first.

Projects
If you have data at hand, you can analyze it as a project that can replace the lab portion of your final. For the project, you need a data set, preferably your thesis data, and you will follow the data through with various statistical methods. The project will be graded on quality of writing, appropriateness of methods chosen, and the overall interpretation.

Software
We will learn to use the R, a FREE program for statistics with many contributed libraries. The class will be very technology oriented. An additional FREE stats program that is likely to be useful is the student version of SYSTAT called MySTAT available at www.systat.com. PAST, another FREE stats program, may be used in the class.

I will be using Excel and Word in class. If you don't have those programs, you will be able to accomplish the same tasks with the free office software suite OpenOffice available at openoffice.org.

Blackboard
This class will make use of Blackboard web-based software. All grades, announcements, handouts, data sets, and lab/homework assignments will be posted there. Everyone in the class should have a Blackboard account ASAP.

Attendance, Absences, etc.
If you have to travel for work or school, become sick, or have another valid reason for missing a homework or quiz, talk to me and we can work something out. I am flexible when work or life concerns are involved. The university allows instructors to initiate withdrawals for absences and/or lack of performance by the last add/drop date and any low attendance, zero scores for two or more assignments, or missing a quiz/exam and not following up, as well as other indicators of inadequate performance, may lead to instructor initiated withdrawal from the course.

Ethics
Students are expected to adhere to the University code of conduct (see UAF catalog). Unethical behavior includes reviewing another person's homework without permission, copying homework, and using unauthorized notes during a test in class. At my discretion, I may take points off or give a zero for the homework, zero for the test, or have the student removed from the class. Repeated offenses of plagiarism by students will result in all students involved being penalized.

Student Support and Disability Services
The Office of Disability Services works with instructors to provide equal access and reasonable accommodations for all students. I am happy to work with the Office of Disabilities Services (208 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities.

Tentative Schedule/Preliminary Topic List:

Week of:	Topic	Chapter and sections
Week 1	Classes Start at UAF.	
Week 2	First Class: Introduction to class, introduction to statistics. Lab: Intro to Excel and RCommander, descriptive measures in Excel and R.	1.1-1.5
Week 3	Review of elementary statistics: confidence intervals and t-tests. Lab: Basic statistics in Excel and R. Spreadsheet formulas, manipulating data.	2.2, 2.3, 3.1, 3.2.
Week 4	Linear Regression: What it is, why use it, and what does a regression mean. Lab: simple linear regression.	5.1, 5.2, 5.3, 5.4, 5.6, 5.7.
Week 5	Linear Regression: Checking assumptions, correcting model, transformations. Lab: simple linear regression, checking assumptions. **Midterm 1.**	4.2-4.5, 5.3.8-5.3.10.
Week 6	Linear Regression: Multiple linear regression. Lab: Continuing regression topics and multiple regression.	6.1, 6.6.
Week 7	ANOVA: What it is, why use it, and what does an ANOVA test mean. Lab: one-way ANOVA, multiple comparisons.	3.4, 8.1-8.4, 8.6, 8.10.
Week 8	ANOVA: Checking assumptions, two-way ANOVA, multiple comparisons. Lab: Multi-way ANOVA.	9.1 – 9.5.
Week 9	Spring Break.	
Week 10	ANOVA: Other Designs. Lab: Other designs. **Midterm 2.**	10.1-10.14, 11.1-11.10.
Week 11	Generalized linear models: Logistic regression, poisson regression. Lab: Logistic regression.	13.1-13.6.
Week 12	Nonparametric statistics: Why use nonparametrics, how do they compare? Lab: Rank statistics, categorical regression trees, others.	5.5, 5.3.15, 8.5, assigned readings.
Week 13	Multivariate Analysis: An ecological approach to multivariate analyses. Lab: Why multivariate analysis and data formats for multivariate analysis. Lab: Ordination (PCA, MDS, CCA)	17.1-17.8
Week 14	MDS and cluster analysis. Lab: MDS and cluster analysis.	18-1-18.4.
Week 15	Wrap up on multivariate statistics. Lab: final projects.	
Week 16	Review. Final Exam. TBA.	

UAF Office of Information technology may provide limited support for computer issues. If you don't have antivirus protection on your computer, go to the UAF computer download site and download the free Symatec antivirus program. AVG Free is also a good resource.

Memo

To: Curriculum Committee SFOS

From: Arny Blanchard

Re: Class proposal for MSL 494, Data Analysis for Marine Biologists

I have revised the class proposal and syllabus for MSL 494 Data Analysis for Marine Biologists. I made all corrections to the class proposal and the syllabus as requested with one exception. I proposed that the class be taught in the spring and the curriculum committee suggested that the class be offered in the fall. This class, however, fits into a sequence with BIO 680, data analysis for biologists which is offered in the fall. Although currently listed in the catalog as being offered every other year, BIO 680 is now being offered annually and I am teaching that class. So the proposed class, MSL 494, would fit in best with BIO 680 by being offered in the spring to be followed by BIO 680 in the fall. I am certainly willing to discuss this further if necessary.

The frequency of the class was not indicated in the class proposal but in discussions with Katrin, it appears that we should offer this class every year. It should have enough interest among all students in biology-related fields to keep the class full. Thus, I proposed the class as being offered annually in the spring.

<u>Curriculum Committee SFOS</u>

Members: Trent Sutton (Chair)
                Katrin Iken
                Jeremy Mathis

20 August 2010

Trial Course
Course Number: MSL 494
Course Title: Data Analysis for Marine Scientists
Instructor: Arny Blanchard
First Time of Offering: Yes

General Recommendations:

None

<u>Faculty Senate Form:</u>

Clarify and Address the following:

- Please fill out the top part of the form (department, college/school, prepared by, phone, email contact, faculty contact). ✓
- Please add Christina Neumann's email address (clneumann@alaska.edu) to the email contact line in addition to your email address. ✓
- This course should be cross listed with fisheries as there are students in that program that would take it. ✓
- Frequency of offering – Is the intent to offer this class annually or in alternate years? Should the class be offered only as demand warrants? Because of the large number of courses offered during the spring semester (and comparatively few courses being offered during fall), the committee recommends that this course be offered during the fall semester (unless justification for the need of a spring course offering is provided). ✓ *see letter*
- For the course description, replace "Practical statistics" with "Data analysis". *not changed* ✓
- Section 15, state "None" for special restrictions. ✓
- Section 16, state "$0" for course fees. ✓
- Need to provide an estimated impact (section 18). For example, do you need access to a computer lab? Since the instructor is research faculty, has the Dean approved the allocation of funds to cover salary for the course? You also need to provide justification as to why there are no tenure-track faculty that could or should be teaching this class. ✓
- In section 21 (Positive and Negative Impacts), change the first line to state "This course will fill a need for upper level marine biology and fisheries students…". Also, in the last line at the end, at FISH 631 (Franz's class). ✓

Syllabus:

- You state Quinn and Keough for the text and then list it also as a possible text. ✓ Need to clarify that.
- Course description – Change "Practical statistics" to "Data analysis". Please be *not changed* sure that the course description on the syllabus matches that on the form.
- Course readings – Please remove sentence 1, very confusing. ✓
- Your learning outcomes are more what students will do and how they will be ✓ graded. You will need to formulate true learning objectives. If you need examples, they can be provided. *EMAIL*
- For grading, need to identify the number of points required for each grade. For ✓ the text paragraph on grading, please convert into a table as it will be much easier to read. Also, you cannot have XX quizzes and XXX points; you need numbers there.
- You have your final exam date listed as December. It will be in May, but dates ✓ are not available yet.