

**Math 489A Actuarial Senior Seminar: Predictive Analytics and Actuarial Modeling**

**Online: Weekly virtual meeting MONDAY @1PM vis Zoom  
(Meeting invitation link will be announced on Canvas)**

**Instructor:** Professor Yvonne Chueh  
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**Office hours:** by email appointments.  
[www.cwu.edu/faculty/chueh](http://www.cwu.edu/faculty/chueh).

The actuarial modeling process, including *problem definition*, *model selection* and *validation*, and *communication* of results and uncertainties. Includes a capstone senior project. Pre-reqs: MATH 410B and (MATH 419B or MATH 417B) with grades of C or better

**Capstone Senior Project:** You are required to complete an independent individual or a team project (up to 3 team members). This project is to investigate a real-world overarching question that can benefit from applying life contingency models, predictive analytics, computer programming, or actuarial mathematics. Making a presentation individually (for individual project) or contributing to a team presentation (for a Team Project) is expected for everyone in class. A written project report will be due in the last week of class. For a team project, peer evaluation and contribution area for each member should be included as a separate part of the final project report.

**Grading plan:**

- Attendance: self-assessment combined with Canvas Activities Records (50 points)
- Assignments posted on Canvas (250 points)
- Senior Project Oral Presentation, with PPT slides and R code file (50 points)
- Senior Project Written Report (150 points)

**Total: 500 points**

A perfect score on both of the above categories would result in a total of 500 points. Your course grade will be determined by the percentage  $p$  of these points you earn, according the following scale.

A (100-94%) A- (93-90%) B+ (89-87%) B (86-83%) B- (82-80%) C+ (79-77%)  
C (76-73%) C- (72-70%) D+ (69-67%) D (66-63%) D- (62-60%) F (59-0%)

## In-Class or Stay-at-home activities:

<b>Learner Outcome</b>	<b>Activity (optional)</b>	<b>Assessment</b>
Assess the strengths and weakness of data and conduct basic data validation	In-class exercises will ask students to assess the strengths and weaknesses of given data sets and work with a given data set to conduct data validation checks.	Graded assignments and capstone project proposal.
Formulate an actuarial problem in terms that are amenable to a solution.	In-class exercises will ask students to identify actuarial problems and to propose tentative models that may be useful to address those problems.	Graded assignments and capstone project proposal. The project proposal will require students to formulate an actuarial problem and select initial models and methods.
Select an appropriate model that addresses an actuarial problem.	In-class exercises will ask students to explain why a given model is or is not appropriate for addressing a particular problem, use a training data set to estimate parameters, and assess whether assumptions of a selected model hold.	Graded assignments; capstone project will be graded in part on selection of an appropriate model.
Evaluate a model and assess whether the model is valid for its intended purpose.	In-class exercises will ask students to conduct sensitivity, stress, and scenario tests, and use holdout data to validate a model.	Graded assignments; capstone project report.
Communicate the results of an actuarial analysis clearly, including any limitations and uncertainties.	In-class exercises will ask students to evaluate draft communications for how effectively they communicate the analysis, any limitations and uncertainties, and explain how the analysis addresses the actuarial problem.	Capstone project report will be assessed in part on the clarity and effectiveness of the writing and communication.

# **Senior Project Assessment Rubric**

## **Title**

A concise title describing your project is required. Your title is the first impression of the project that may draw the readers to continue reading or, on the contrary, become clueless (if too broad) or lose interest (if too narrow). The title needs to be approved by the instructor.

## **Abstract**

Your abstract should summarize the project by including the motivation and basic focus of your work, the major questions you have addressed, the technique approaches as well as the work you have planned or completed.

## **Introduction**

It should expand on your abstract by elaborating your work in a larger context. You should state here your big idea – your thesis – that the rest of the report will lead to. It can organize the project report by outlining separate sections in the remaining report.

## **Methodology**

Describe the actuarial fundamentals and equations incorporated in your methods, and ultimately, spreadsheet implementations when applicable. Actuarial symbols used need to be defined clearly. Critical concepts whenever used should be explained and referenced by a citation. Special techniques and computer programming used to create or advance your Excel workbook should be specified and included in the Appendix. Life tables, mortality rates, survival models, underlying assumptions, and other parameters (with their estimated quantities) essential to the methodologies need to be described and related.

## **Results and Deliverables**

This is the section in which you will give an introduction or even demonstration of your work (e.g. spreadsheet with predictive functionalities and capabilities; R programs; Mathematica Notebook, ..., etc). Your work should result in actuarial analysis of your Excel workbook or computer program output report. The results are often in the form of tables, graphs, figures, screenshots of user interface, output of computer codes. It is vital to the overall success of the entire project. This is where you tell the reader what your project has implemented and what valuable output it can deliver! Probably this will not include every policy calculation you ran, but rather only the representative and interesting ones. It would be the best if your deliverables and results were reformatted to look professional and presentable rather than what usually comes out of initial software output. For example, your graphs must be very nicely formatted, labeled, and explained. Results of meaningful actuarial calculations and comparisons responding to the project title will go here.

## **Discussion and conclusion**

The Discussion section is the most-read section of most papers. Here is where the reader will turn to find out both what you found, and how to interpret it. Many particular things of interest are given in this section.

You may want to compare your results to the results of previous studies/conjectures here, or to common sense. You will certainly want to discuss what these results mean in the context of a predictive life contingency model from life insurance & Annuity industry or other types of products described in the project title (e.g. Pet Insurance, Property & Casualty Insurance, Cyber Security Insurance, Enterprise Risk Management, Investment, Pension, Autonomous Vehicles,..., etc. If you would like to recommend that particular action be taken because of your analysis, this is a good place for this.

**NOTE: For the purposes of connecting, the Results and Discussion sections do not necessarily have to be separate. You could report the results of one of your questions, and then discuss it, and then go on to the next question. This is fine!**

### **Future research or applications**

Now you can return to your thesis, summarizing the important results, and trying to put them into a future perspective on how your project work can be applied by others or used as a valuable resource. This is where people look for insight on the potential of your project in its value to other applications, variations, or educational opportunity.

### **References**

Published/or unpublished Articles or data sources that contributed to your project.

### **Appendix**

Techniques or information supplementing your main report but too lengthy to be included in the sections. For example, they might be the actuarial symbols, screenshots of your program, programming codes, proofs of equations, life tables,..., etc. By completing the appendix material, your report and project can be validated or used by others.

**Total “content of paper” points 150 points**

### **Not a section of your report, but important in grading:**

Does the paper explain all actuarial terms and equations used? 20 points

Are all figures labeled and referred to appropriately? 15 points

Is the paper well-written, with correct grammar and clear communications/explanations? 15 points

**Total “communication” points 50 points**

**Oral Presentation Requirements:**

1. PPT Slides designed and compiled by student group
2. Supporting R Code, Excel File, and Data Work Files
3. PPT Presentation Recording With Audio, or Live PPT Presentation in Zoom meeting
4. Peer Evaluation Form

<b>Peer Evaluation of an Oral Presentation</b>			
<b>Project Name</b>	<b>Very Good</b> <b>2</b>	<b>Satisfactory</b> <b>1</b>	<b>Poor</b> <b>0</b>
Gave an interesting introduction			
Presented clear explanation of the senior project			
Link the senior project to its general significance			
Offered a concluding summary to the entire work			
Spoke clearly, correctly, distinctly, and confidently			
Maintained eye contact and acceptable posture			
Noticeable originality or innovations in any aspect			
Presentation helps the audience understand			
Used visual/audio aids creatively or effectively			
Handled questions and comments from the class with knowledge and enthusiasm			
<b>Total _____ (of 20)</b>			

<b>Your name</b>	<b>Rate 0-10,</b>		<b>0 being the least and 10 the most.</b>						
<b>Date</b>									
<b>Names of Team Members</b>	<u>Contributions</u>	<u>Work Quality</u>	<u>Effort</u>	<u>Attitude</u>	<u>Focus on Task</u>	<u>Work with Others</u>	<u>Problem Solving</u>	<u>Group Efficacy</u>	<u>Comments</u>

**Weekly Meeting Information:**  
**Yvonne Chueh is inviting you to a scheduled Zoom meeting.**

**Topic: Math 489A**

**Time: Apr 13, 2020 01:00 PM Pacific Time (US and Canada)**

Every week on Mon, until Jun 8, 2020, 9 occurrence(s)

Apr 13, 2020 01:00 PM

Apr 20, 2020 01:00 PM

Apr 27, 2020 01:00 PM

May 4, 2020 01:00 PM

May 11, 2020 01:00 PM

May 18, 2020 01:00 PM

May 25, 2020 01:00 PM

Jun 1, 2020 01:00 PM

Jun 8, 2020 01:00 PM

Please download and import the following iCalendar (.ics) files to your calendar system.

Weekly:

[https://zoom.us/meeting/tZIodOqvqT4v64lvTaOSA02MtkatWIGqsA/ics?icsToken=98tyKuGuqzg pHdOQtV3te6ktOZ37b8-1lCcaprVpnTDWli8BTxf9N9Z1G5VuA\\_mB](https://zoom.us/join/https://zoom.us/meeting/tZIodOqvqT4v64lvTaOSA02MtkatWIGqsA/ics?icsToken=98tyKuGuqzg pHdOQtV3te6ktOZ37b8-1lCcaprVpnTDWli8BTxf9N9Z1G5VuA_mB)

## **HOW TO JOIN THE WEEKLY ZOOM MEETING?**

To join the meeting, please give yourself extra 10 minutes to set up your computer. By clicking the following [URL link](#) you will enter the meeting room. Webcam installed on your computer is highly recommended but not required. You can access the audio function using your computer speaker and microphone or simply use your phone to dial in. (**Instruction of dial in is at the end of this document.**)

The most features we use most frequently in the Zoom Meeting would be [screen sharing](#) of your computer screen for Q&A and class discussion. Everyone will have an opportunity to be the host in the Zoom Meeting when it is proper. You will earn a great asset of hosting a zoom meeting after this class.

**Join Zoom Meeting**

**<https://zoom.us/j/865337755>**

**Meeting ID: 865 337 755**

One tap mobile

+16699006833,,865337755# US (San Jose)

+13462487799,,865337755# US (Houston)

**Dial by your location**

**+1 669 900 6833 US (San Jose)**

**+1 346 248 7799 US (Houston)**

**+1 301 715 8592 US**

**+1 312 626 6799 US (Chicago)**

**+1 929 205 6099 US (New York)**

**+1 253 215 8782 US**

**Meeting ID: 865 337 755**

**Find your local number: <https://zoom.us/u/ab9WZs7DI2>**

*A word of Wisdom: Early and clear communication is the key to your success in every class, including this one, besides your hard work, which is a GIVEN I assume from you. Please work with me and the classmates, talk to me if there is anything that you might need additional assistance or help. We are forming a learning community in Math 489A, and I am excited to see how the class can facilitate the completion of your senior project. Now Go do the work! By going through the documents on Canvas, then bring me your questions!*