

Department of Mathematics
Central Washington University

Math 419A Actuarial Mathematics I
Fall 2022
SAMU 115, 1:00 – 1:50 P.M., (M,T,W,R)

Instructor: Dr. Yvonne Chueh

Office: SAMU 118 | **Phone:** 963-2124

E-mail: chueh@cwu.edu

Office Hours: M-F 9:00-9:50, and by appointment. You are *always* most *welcome* and *encouraged* to contact me for a question or come to my office hour.

Prerequisite: Math 411A and permission.

Text:

1. *Actuarial Mathematics for Life Contingent Risks, 2nd Edition*, 2013, Dickson, D., Hardy, M., Waters, H., Cambridge University Press, ISBN: 978-1-110704-407-4. Exercises are considered part of the required readings.
Math 419A Chapters 1-4; Entire Math 419 sequence covers Chapters 1-13 (Except Section 11.5)
2. Actex manual for Exam FAM-L

Supplementary Text:

Life Contingencies: The Mathematics, Statistics, and Economics of Life Insurance

An open text authored by the Actuarial Community

<https://openacttextdev.github.io/LifeCon/>

ACADEMIC POLICIES & PROFESSIONAL PROTOCOL

The following policies and protocols have been established based on university policies and state and federal laws. They are equally binding for all students enrolled in each of my classes.

A. Equal Educational Opportunity:

Central Washington University seeks to provide reasonable accommodations for all qualified individuals with disabilities. Accommodations are intended to minimize the functional limitations of a disability and provide the student equal access to the educational process. Please inform me how I might support you in this regard.

B. Discrimination, Intimidation, & Harassment:

Hate speak and racist or sexist dialogue and behaviors will not be tolerated. The right of all students to equal access of the course content in an environment free of prejudice, discrimination, and harassment will be respected and upheld. All illegal behavior will be reported to the proper municipal and university authorities.

C. Professional Participation:

The nature of the course requires that each student be treated with respect, dignity, and sensitivity. While we can agree to disagree in a professional manner, all students are responsible for actively participating in all classroom activities in a positive, sensitive, and contributory manner. **Each class members' professionalism will be evaluated based on the instructor's discretion.**

Students will also be graded on their active, professional participation. **Please turn off your electronic devices completely during class session.** Be advised you will be marked down **without warning** for playing computer games, checking or looking at mobile phones, watching DVDs, talking on the phone, reading the newspaper, grading papers or projects, studying for other exams, working on other class assignments, engaging in incessant talking of a social nature, and / or (but not limited to) behaviors that disturb the learning environment for other students.

D. Attendance Policy:

Punctual attendance is required. You need to be in class to get credit. Extra credit will be awarded for good attendance and participation.

If you are an athlete and have games or practices scheduled during class, you must present appropriate documentation that will excuse you from class before the events take place. A coach or faculty member must officially confirm the documentation.

E. Late Assignments:

Late assignment will not be accepted. No exceptions will be made once deadlines are established. Submissions must be made through Canvas system for grading. Email submission will not be accepted.

F. Academic Integrity:

All cheating, plagiarism and forgery will be referred for disciplinary action and automatically result in an "F" for the course. You are obligated to cite all electronic or bibliographic references for works that are not authored or created by you. If a document has been translated, please give credit to the person whose talents made it readable to you or others.

All violations of the student code will be reported to the Department of Mathematics, College of the Sciences, Vice President for Student Affairs & other CWU departments for disciplinary action.

Grade Assessment:

1. Class Attendance (50 points)

All students are responsible for actively participating in all classroom sessions in a positive, sensitive, and contributory manner. Please note passivity in discussion/response will be equally as noticeable as active response and discussion in class for the grading reference.

See Attendance Policy: Extra credit points will be awarded to those students who do not miss class or are absent only once. **Repeated late arrivals /disappearance/early departures without a good reason will result in a drop of the letter grade.**

If you are an athlete and have games or practices scheduled during class, you must present appropriate documentation that will excuse you from class. Please consider taking the class at another time if you cannot be here on a timely and consistent basis.

Please be on time for class. If you are late, have the courtesy not to disrupt the learning environment.

2. Professionalism (25 points)

Punctual attendance is required as part of the **Professionalism** requirement. You need to be in class to earn credit.

Informal assessment on participation: We will treat each other with courtesy, cordial civil manner and sensitivity, flexibility. This "Professionalism" category refers to one's chosen actions, attitude, and choice of words in the public, during class discussion, in writings, through course assignments, in forms of communications on your grades or sharing personal opinions. This category is evaluated according to the instructor's discretion.

When class in session, electronic device of all sorts are required to **turn off and put away out of sight**. Any of the following disruptive behaviors will result in **5%** taken off in the final grade **each time of incident**: Playing computer games, repeated early departure, repeated disappearance, and repeated late arrival, repeated cell phone disruptions, **electronic texting, surfing internet**, reading the newspaper, grading papers or projects, studying for exams, working on other class assignments, engaging in **incessant talking of a social nature**, and / or (but not limited to) behaviors that disturb the learning environment for other students. Points will be taken off by the instructor's discretion (No warnings given). Inappropriate and unprofessional academic behaviors will be reported to CARR (Committee for Academic Recruitment and Retention) for advisement and improvement plan.

To earn all professionalism and attendance points you must exhibit to a HIGH DEGREE the following:

- Collegial Support (5 points)
- Positive Attitude (5 points)
- Perfect Attendance (5 points)
- Active Participation (5 points)
- All materials complete & on time (5 points)

Grading policy:

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|---|--------------|
| • Attendance | (50 points) |
| • Professionalism | (25 points) |
| • Actex exercises and other assignments | (125 points) |
| • Three Tests | (300 points) |
| • Final exam | (100 points) |

Total: 600 points

A perfect score on both of the above categories would result in a total of 600 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%)

Course outlines:

	<u>Topic</u>	<u>Days</u>
I.	Survival Distributions Life Tables	5
	1. The Survival Function	
	2. Time-until-Death for a Person Age x	
	3. Curtate-Future-Lifetimes	
	4. Force of Mortality	
II.	Life Tables	6
	1. Life Tables	
	2. The Deterministic Survivorship Group	
	3. Assumptions for Fractional Ages	
	4. Some Analytical Laws of Mortality	
	5. Select and Ultimate Tables	
III.	Life Insurance	8
	1. Insurance Payable at the Moment of Death	
	-Level Benefit	
	-Endowment	
	-Deferred	
	-Varying Benefit	
	2. Insurance Payable at the End of the Year of Death	
	3. Relationships between Insurance Payable at the Moment of Death and the End of the Year of Death	
	4. Differential Equations for Insurances Payable at the Moment of Death	
IV.	Life Annuities	7
	1. Continuous Life Annuities	
	2. Discrete Life Annuities	
	3. Life Annuities with m -thly Payments	
	4. Relationships between Continuous and Discrete Life Annuities	

5. Relationships between Life Insurance and Life Annuities

TESTING	1
TOTAL	27

Class format: Mixture of lectures and in-class problem solving. Students present their solutions of the assigned problems and answer any question raised by the instructor and other students.

Tentative Schedule (The Instructor reserves the right to add or drop quizzes as well as other changes necessary to move the progress forward in light of balancing student learning and course objectives. Any change will be announced in class.)

<u>Week</u>	<u>Reading Assignment</u>
1. 9/21-9/23	Life and Annuities basic information, Age-at-death random variables, Future Lifetime of Individual Age x , Actuarial Notation Text Reading: 2.1, 2.2, 2.4 Actex Reading: 1.1~1.3 Actex Exercise 1: #1~9 (Due on Sept. 23)
2. 9/26-9/30	Curtate Future Lifetime, Force of Mortality Text reading: 2.3, 2.6 Actex Reading 1.4~1.5 Actex Exercise 1: #10~20 (Due on Sept. 30)
3. 10/3-10/8	Chapter 1 Review Actex Exercise 1: #21~24 (Due on Oct. 3) Test 1 (Covering Survival Distributions, Actex Chapter 1, Text Chapter 2) Test 1 on Friday, Oct. 8
4. 10/10-10/15	Life Tables, Life Table Functions, Fractional Age Assumptions, Select-and-Ultimate Tables, Moments of Future Lifetime Random Variables.

Text Reading: 3.1~3.3, 3.7~3.9, 2.5~2.6
Actex Reading: 2.1~2.4
Actex Exercise 2: #1~20 (Due on Oct. 15)

5. 10/17-10/21

Useful Shortcuts
Actex Reading: 2.5
Actex Exercise 2: #21~33 (Due on Oct. 21)

6. 10/24-10/28

Test 2 (Covering Life Tables, Actex Chapter 2, Text Chapter 3)

Continuous Life Insurance, Discrete Life Insurance
Text Reading: 4.4.1~4.4.2, 4.4.5~4.4.7
Actex Reading: 3.1, 3.2
Actex Exercise 3: #1~9 (Due on Oct. 28)

7. 10/31-11/4

mthly Life Insurance, Relating Different Policies,
 Recursions, Relating Continuous Discrete and mthly
 Insurance
Text Reading: 4.4.3, 4.4.4, 4.4.8, 4.5
Actex Reading: 3.3~3.7
Actex Exercise 3: #10~25 (Due on Nov. 4)

8. 11/6-11/11

Actex Exercise 3: #26~40 (Due on Nov. 11)

**Test 3 (Covering Life Insurance, Actex Chapter 3,
 Text Chapter 4)**
No Class on Nov. 11 (Veterans Day)

9. 11/14-11/18

Continuous Life Annuities, Discrete Life Annuities
 (Due, Immediate)
Text Reading: 5.4, 5.5, 5.9, 5.10
Actex Reading: 4.1~4.3
Actex Exercise 4: #1~5 (Due on Nov. 18)

10. 11/21- 11/25

Actex Exercise 4: #6~20 (Due on Nov. 25)

THANKSGIVING!! (Nov. 23~25)

11. 11/28-12/2

mthly Life Annuities, Relating Different Policies,

Recursions, Relating Continuous Discrete and
mthly Life Annuities

Actex Exercise 4: #21~47 (Due on Dec. 2)

12. 12/5-12/9

**Final Exam (Covering Life Annuities, Actex
Chapters 4, Text Chapter 5)**

The Final Exam date will be according to the university schedule.
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