Salisbury University Department of Mathematical Sciences

MATH 415 : Actuarial and Financial Methods
Syllabus (Tentative)

Description: Introduction to models of survival, individual life insurance and life annuities emphasizing the traditional actuarial functions of determining premiums and reserves from a stochastic point of view. Topics include multiple life theory, models with expenses, stochastic process, and/or other selected topics.

4 Hours Credit: Meets four hours per week.

Prerequisites: C or better in MATH 215 and MATH 413.

Intended Audience: Math majors electing the actuarial science track, actuarial minors, and others interested in the application of probability theory to insurance and finance.

Objective: To provide an understanding of mathematical models for actuarial sciences and finance. Topics includes severity models, frequency models, aggregate models, coverage modifications, risk measures, construction and selection of parametric models, credibility, insurance and reinsurance coverages, pricing and reserving for short-term insurance coverages, and relevant topics.

Textbooks: *Actuarial Mathematics for Life Contingent Risks, 3rd Edition* , by Dickson, Hardy, and Waters, 2020.

Technology: Common statistical packages such as R, Excel, Python, and/or others may be used for analyses.

Topic	Weeks
Survival Models	1
Definition of the survival function, force of mortality, and the life table for use in studying continuous future life time and curtate future life random varaibles for a life that have survided to age x¿0.	
Life Insurance and Life Annuities	2
Stochastic (random present value variable) and deterministic approaches (life table) used to calculate the acutarial present value of a death benefit or survivial benefit (pension); continuous and discrete models; expenses not included.	
Annual Benefit premiums and Benefit Reserves	3
Calculation of annual benefit premiums from deterministic and stochastic (loss function random variable) approaches; determination of future liability for a policy in force (reserving - setting aside funds to pay eventual benefits); calculation of the probability that a fund is sufficient to cover future benefits for a group using an aggregate loss function; spreedsheet approach to illustrating results; assets and liabbilities.	
Multiple Life Theory	2
Insurances and annuities covering a pair of lives (e.g. a benefit paid at the first death of a pair of lives to the survivor).	
Models with Expenses	2
Life insurance and annuity model including expenses and profit; asset share pricing.	
Simulation and the Empirical Distribution	1
The inversion method; estimation of F(x) from the empirical distribution; application to earlier theory.	
Pension Plans and Retirement Benefits	1
Understand how retirement benefits are accured, valued, and funded.	
Projects and Tests	2

Topic	**Weeks**
Total	**14**

Evaluation

Participation	0-5%
Projects	0-25%
Homework/Quizzes	10-20%
Exams	30-45%
Final Exam/Project	25-40%

- Graduate students will be assigned special homework/test problems or projects.
- Clear descriptions of thought processes, evidence of critical thinking, and effective communication must be demonstrated in written work.
- **Writing Across the Curriculum:** Students will be expected to communicate mathematics and mathematical ideas effectively in speech and writing. At the University Writing Center, trained consultants are ready to help you at any stage of the writing process. In addition to the important writing instruction that occurs in the classroom and during professors' office hours, the Center offers another site for learning about writing. **All students are encouraged to make use of these important services.**
- **NOTE:** Once a student has received credit, including transfer credit, for a course, credit may not be received for any course with material that is equivalent to it or is a prerequisite for it.