King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
AS481: Actuarial Contingencies 2 - Term 212   (3-2-4)

Course Objectives:

A continuation of Life Contingencies I. Development is based on a stochastic approach to insurance models. Major topics include benefit premiums and reserves, and multi-life and multiple-decrement models. Parallel treatment of topics based on Takaful system. Application of such area in life insurance and property.

Prerequisites: AS 381

Textbook and Package:

1. Camilli, S.J., Duncan, I., & London, R.L. (2014) *Models for Quantifying Risk, 6th edition*. ACTEX Publication: Winsted, USA.
2. Texas BAII Plus Calculator or Texas BAII Professional

Reference:

1. Dickson, D.C., Hardy, M. R., & Waters, H. R. (2011) *Actuarial Mathematics for Life Contingent Risks.* Cambridge University Press: Cambridge, UK.
2. Bowers N., Gerber, H., Hickman, J., Jones, D. & Nesbitt, C. (1997 or later printing) *Actuarial Mathematics*, 2nd edition. Society of Actuaries Publishing.
3. Society of Actuaries regulations for LTAM (Long Term Actuarial Models) and sample exams for LTAM

Instructor: Dr. Ali N. Duman   **Office:** Bldg – 5, room – 325.   **Phone:** 013 - 860 2632

E-mail: aliduman@kfupm.edu.sa **(Not by WebCT/Blackboard email)**

Office Hours: UTR: (09:00-10:00am) or by appointment

Assessment

Assessment for this course will be based on attendance, term report, 2 major exams and a comprehensive final exam, as follows:

Activity	Weight
Attendance, Participation	5%
Quizzes	15%
Problem Lab	5%
Group Project	35%
Exam	15%
Final Exam (Comprehensive)	25%

IMPORTANT NOTE on GRADES: There is no quota on the number of students who can get an A+ or other grades.

✓ *Attendance* on time is *very* important. Mostly, attendance will be checked within the *first five minutes* of the class. Entering the class after that, is considered as late (**2 lates= 1 Absence**) and

✓ **More than 10 minutes late = Absence** (regardless of any excuse).

✓ Only University Blue paper Official excuses will be accepted as valid excuse.

Letter grade	A+	A	B+	B	C+	C	D+	D	F	DN
Cut-off	90%	85%	80%	75%	67%	60%	55%	50%	<50%	≥ 9 absences

General Notes:

- Students are required to carry **pens, note-taking equipment** and a **calculator** to **EVERY lecture and exams**. It is strongly recommended to keep a **binder** for class-notes.
- Students are also expected to bring the book, take notes and organize their solved questions in a **binder** for easy retrieval to help them in study and review for class, exams, etc
  - o It is to the student's advantage to keep a binder for storing class notes, homework, and other graded assignments. Students who are **organized** will find it **easier** to find important materials when **studying for exams**.

Home Work:

- To successfully prepare for the SOA exams, students MUST **solve problems** regularly and with discipline. The problem lab problems are specifically designed to prepare you for major and final exams. So, it is expected that you complete these problems **step-by-step** and **with comprehension**.
- ➢ If you happen to stumble upon a *solution manual* somewhere, remember **2 important points**. (1) Due to publishing costs and deadlines, these solutions are brief and may have mistakes and (2) in your career as an actuary and your exams and quizzes in this class, you are expected to know **every step to a problem** and to know if a solution is incorrect. Thus, the best way to solve problem is without these brief solutions.
- *Never round* your intermediate results to problems when doing your calculations. This will cause you to lose calculation accuracy. Your answers may then be different from the SOA exam key even when you use the right procedure.
- For every exam, so you need to bring with you *pens*, *pencils*, *a sharpener*, *an eraser*, and a *SOA approved calculator*.
- Students should wait until completion of course AS481 before they attempt to take the professional exam LTAM.

Academic Integrity: All KFUPM policies regarding **ethics** and **academic honesty** apply to this course.

Tentative Schedule

Week	Sections	Topics	Notes
1	Ch 3 & 5.5	**Review of Markov Chains (3-1/2 class)**.	
2	Ch 3 & 5.5 Ch 13	**Review of Markov Chains (continued).** **Multiple-Decrement Models.** Discrete Multi-Decrement Models. Theory of Competing Risks. Continuous Multi-Decrement Models. Uniform Distribution of Decrements.	
3	Ch 13 Ch 14 & 6-5	**Multiple-Decrement Models. (continued).** Miscellaneous Examples. **Multiple-Decrement Models (Applications).** Actuarial Present Value. Asset Shares. Non-forfeiture Options. Multi-State Model representations, with Illustrations (14.4 & 6.5).	
4	Ch 14 & 6-5 Ch 12	**Multiple-Decrement Models (Applications -continued).** Defined Benefit Pension Plans. **Models dependent on Multiple Survivals (Multi-life Models)**. Joint-Life Model. The Last Survivor model. Contingent Probability functions.	
5	Ch 12 Appendix A.6	**Multi-life Models (continued)** Contingent Contracts Involving Multi-Life Statuses. General Random Variable Analysis. Common Shock – A model for lifetime dependency. Multi-State Model Representation (5.5 & 12.5),	
6	Ch 15	**Models with Variable Interest Rates** Actuarial PV using Variable Interest. Deterministic Interest Rate Scenarios. Spot Interest Rates & Term Structure of Interest Rates.	
7	Ch 15	**Models with Variable Interest Rates (continued).** Forward Interest Rates. An Example with Simulated Rates of Return. Transferring the Interest Rate Risk.	
8	Ch 16	**Universal Life Insurance** Basic Aspects. Indexed Universal Life Insurance.	
9	Ch 16	**Universal Life Insurance** (continued) Pricing Considerations (including Pricing for Secondary Guarantees).	
10	Ch 16 Ch 14.5	**Universal Life Insurance (continued)** **Pension Mathematics**	
11	Ch 14.5	**Pension Mathematics** (continued)	
12	LTAM supplement	**Pension Mathematics** (continued)	.
13	Ch 17	**Profit Testing.**	
14	Ch 17	**Profit Testing.** (continued)	
15	Ch 17 Review	**Profit Testing.** (continued) **Review**	
Final Exam (Comprehensive)			

Learning Outcomes: From the Society of Actuaries Exam LTAM (Long-Term Actuarial Mathematics – Fall 2018) will be observed. By completing this course, students should be able to

➢ Demonstrate a thorough understanding of multi-decrement models
➢ Apply multi-life models to real situations
➢ Distinguish Actuarial Models with fixed interest rates from those with variable returns
➢ Calculate Premiums for Pension Funding of Pension payouts
➢ Compare effects of various assumptions for profit testing
➢ Explain main features of plans under Universal life insurance and participating Insurance
➢ Solve SOA type LTAM problems