

Course Code: 0542-416 (Stat-416) Course Title: Actuarial Statistics
Marks: 50 Credits: 02 Number of Class: 26-28

Rationale:

This course will focus not only on quantitative aspects but also on management aspect. The program intends to train personnel to work in Insurance firms, Pension departments of various organizations, Banks and other Financial Institutions in the national and international arena.

Objectives:

The main objectives of this course are to

- Provide an understanding of the fundamental concepts of financial mathematics, and how these concepts are applied in calculating present and accumulated values for various streams of cash flows.
- Introduce financial instruments, such as derivatives, the concept of no-arbitrage.
- Provide a solid grounding in the subject of life contingencies for single life, and in the subject of the analysis of life assurance and life annuities, including pension contracts.
- Provide an introduction to mathematical methods for managing the risk in life insurance.
- Develop skills of calculating the premium for a certain life insurance contract, including allowance for expenses and profits.

Course Learning Outcomes:

At the end of this course students will be able to

CLO1	Recognize and compute various interest rates, as well as the present and future values of a cash flow.
CLO2	Derive formulae for all kinds of annuities.
CLO3	Given an annuity with level payments, immediate (or due) , payable monthly, (or payable continuously), and any three of present value, future value, interest rate, payment, and term of annuity, calculate the remaining two items.
CLO4	Given an annuity with non-level payments, immediate (or due) , payable monthly, (or payable continuously), the pattern of payment amounts, and any three of present value, future value, interest rate, payment, and term of annuity, calculate the remaining two items.

CLO5	Given an annuity with non-level payments, immediate (or due) , payable monthly, (or payable continuously), the pattern of payment amounts, and any three of present value, future value, interest rate, payment, and term of annuity, calculate the remaining two items.
CLO6	Calculate the outstanding balance at any point in time.
CLO7	Calculate a schedule of repayments under a loan and identify the interest and capital components in a given payment.
CLO8	Calculate the present value of payments from a fixed interest security, bounds for the present value of a redeemable fixed interest security.
CLO9	Given the price, calculate the running yield and redemption yield from a fixed interest security.
CLO10	Explain and analyze the factors that affect mortality, simple life assurance and life annuity contracts
CLO11	Concept (and the mathematical assumptions) of the future life time random variables in continuous and discrete time
CLO12	Define and calculate the different types of the survival probabilities in theoretical and numerical examples

Mapping between PLOs and CLOs of Statistics program:

PLOs CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	3						1	
CLO2	1				2			
CLO3	3							
CLO4	3		2				1	
CLO5	3					1		
CLO6	2			1				
CLO7	3						2	
CLO8	1		1					
CLO9	1							
CLO10	2					1		
CLO11				1				
CLO12								1

Course Content, Teaching and Assessment Strategy

CLOs	Course Content	Teaching Strategy	Assessment Strategy	No. of Lec.
CLO1	The meaning of actuarial science, its relationship with life insurance, role of insurance in the economy, important uses of actuarial statistics specially in context of Bangladesh, role of an actuary.	Interactive Class, Open Discussion, Participatory Q/A Session, Online resources and Practical	Assignments, Class Tests, Presentation, Attendance and Final Examination.	3
CLO2 To CLO7	Theory of rates of interest and discount including theoretical continuous case of forces of interest and discount, annuities and sinking funds including continuous case, practical and theoretical applications primarily to mortgages and bonds, Book value, Bond Amortization schedule, yield rates.			13
CLO8 CLO9	Economics of insurance, utility theory, application of probability to problems of life and death, determination of single premium for insurances and annuities in both discrete and continuous case, perpetuities, unknown time and unknown rate of interest.			7
CLO10 CLO11	Theory and practice of pension plan funding, assumptions, basic actuarial functions, population theory applied to private pensions.			7
CLO12	Survival distributions, life table, life insurance, life annuities, net premium, premium series, multiple life functions, multiple decrement models, valuation theory for pension plans, expense function and dividends. Models for individual claims, approximations for the distributions of sum of claims.			7

Mapping of CLOs with Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Classroom Discussion, Open Discussion, Online Resources, and Participatory Q&A Sessions	Assignments, Class Tests, Presentation, Final Exam
CLO2	Lectures, Problem-solving Activities, Numerical Examples	Class Tests, Report, Summative Exam
CLO3	Problem-solving Activities, Practical Examples	Class Tests, Report, Summative Exam
CLO4	Lectures, Numerical Problem-solving, Practical Case Study Discussions	Class Tests, Report, Summative Exam
CLO5	Problem-solving with Annuities, Case-based Learning	Assignments, Report, Final Exam
CLO6	Interactive Problem-solving on Loans and Balance Calculations	Quizzes, Report, Final Exam
CLO7	Lectures, Amortization Schedules, Loan Repayment Activities	Class Tests, Report, Final Exam
CLO8	Interactive Lecture, Problem-solving with Fixed Securities	Assignments, Class Tests, Final Exam
CLO9	Calculation-based Learning, Financial Instrument Analysis	Class Tests, Report, Summative Exam
CLO10	Lecture, Demographic and Insurance Data Analysis, Case Studies	Assignments, Report, Final Exam
CLO11	Theoretical Lectures on Life Time Random Variables, Simulation	Class Tests, Report, Summative Exam
CLO12	Lectures on Life Tables, Decrement Models, Numerical Examples	Assignments, Report, Final Exam

Text Book

1. Parmenter : *Theory of Interest and Life contingencies with pension Application.*

Reference Books

1. Bowers, N.L., Gerber, H.V., Hickman, J.C., Jones, D.A. and Nesbitt, C. J.: *Actuarial Mathematics.*
2. Uddin, Mohammad Sohrab: *An Introduction to Actuarial and Financial Mathematics.*