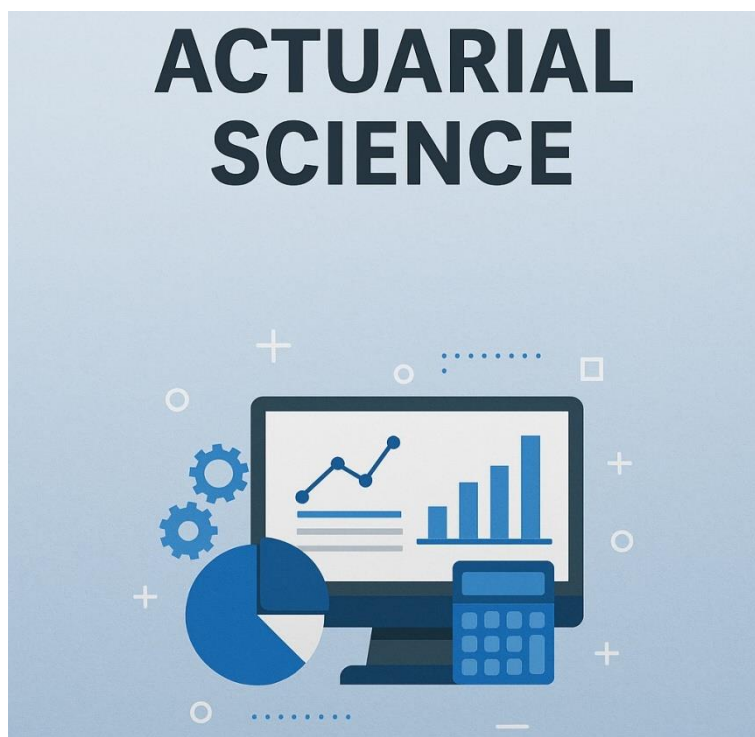


Learning Outcomes-based Curriculum Framework (LOCF) for Post-graduate Programme



Name of the Programme:

M.Sc. Actuarial Science



UNIVERSITY OF KERALA

Department of Demography

2026

PREAMBLE

The role of higher education is vital in securing gainful employment and providing further access to higher education comparable to the best available in the world-class institutions elsewhere. The improvement in the quality of higher education, therefore, deserves to be given top-most priority to enable the young generation of students to acquire skill, training and knowledge to enhance their thinking, comprehension and application abilities and prepare them to compete, succeed and excel globally. Sustained initiatives are required to reform the present higher education system for improving and upgrading the academic resources and learning environments by raising the quality of teaching and standards of achievements in learning outcomes across all undergraduate programs in science, humanities, commerce and professional streams of higher education.

One of the significant reforms in higher education is to introduce the Learning Outcomes-based Curriculum Framework (LOCF), which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. The University Grants Commission (UGC) took the initiative of implementing the LOCF in the Colleges and Universities of the country. Accordingly, the University of Kerala has decided to implement the LOCF in all its departments under the auspices of the Internal Quality Assurance Cell (IQAC). A series of teacher training workshops were organised by IQAC and the office of the Credit and Semester System (CSS), and the departments have revised the syllabus accordingly, through workshops and in consultation with academic experts in the field.

GRADUATE ATTRIBUTES (GAs)

The Graduate Attributes (GAs) reflect particular qualities and abilities of an individual learner, including knowledge, application of knowledge, professional and life skills, attitudes and human values that are required to be acquired by the graduates of the University of Kerala. The GAs include capabilities to strengthen one's professional abilities for widening current knowledge and industry-ready skills, undertaking future studies for global and local application, performing creatively and professionally, in a chosen career and ultimately playing a constructive role as a socially responsible global citizen. The GAs define the characteristics of learners and describe a set of competencies that are beyond the study of a particular area and programme.

The GAs of the University of Kerala

- Continue lifelong learning as an autonomous learner
- Continuously strive for excellence in education
- Apply and nurture critical and creative thinking
- Promote sustainable development practices
- Promote co-operation over competition
- Balance rights with responsibilities
- Understand and respect diversity & difference
- Not be prejudiced by gender, age, caste, religion, or nationality.
- Use education as a tool for emancipation and empowerment of humanity

ABOUT THE DEPARTMENT OF DEMOGRAPHY

The University of Kerala has the distinction of being the first University in India to introduce Demography as a scientific discipline at the post-graduate level (M.Sc. in Demography) in 1963 at the Department of Statistics. Initially attached to the Department of Statistics, it became a full-fledged department- Department of Demography and Population Studies in 1979 under the leadership of the late Dr R. Ramakumar, who was then Professor and Head of the Department of Statistics. In 1997, the department was renamed as the Department of Demography.

The department offers MSc, MPhil and PhD programmes and also carries out research and extension activities in the field of population. The department also provides an MSc programme in Actuarial Science since 2013. The MPhil programme in Demography was initiated in 1983, and that of Actuarial Science was instituted in 2011. The curriculum and Syllabus prepared and finalised by the Board of Studies are updated once in three years to incorporate the latest developments in the respective areas. Based on demand from the industry, we redesigned the MSc programme in Demography to include sufficient content from Biostatistics, and the course was renamed as MSc Programme in Demography and Biostatistics in 2018.

The department actively researches in various fields of mortality, fertility, migration, urbanisation, reproductive and child health, ageing of the population and periodically publishes reports. The research outcomes of the department and the PRC, apart from providing valuable information to Governmental and non-governmental organisations, create awareness among the public regarding the current population scenario.

Publication of an internationally accepted journal "Janasamkhyā" was started by the department in the year 1983 and has been published semi-annually. Research articles, notes and reviews on topics relating to Population Studies, particularly Technical demography, will be considered for publication in the Journal.

Workstation for Research on Micro-data from Census has been set up at the Department of Demography, by the Directorate of Census Operations, Kerala, Ministry of Home Affairs, Government of India and the University of Kerala. The objective of setting up the workstation is to permit qualified researchers to use anonymised micro-data from the Census optimally for in-depth research by allowing access for generating cross-tabulations not published by the Census. The facility is open to all, including those who are not enrolled or part of the University.

The workstation is fully equipped with all the facilities for research on confidential micro-data from Census 2001 and Census 2011. The researcher will be permitted only to use the software made available at the workstation for tabulation. The researchers may also use the printer installed in the workstation to print the approved outputs. She/he will, however, not be allowed to take out the soft copy of the micro-data in any format.

The department has a library with about 7000 books related to different areas of population, which are Catalogued and arranged for easy access. The library is used by students, teachers, and researchers from inside and outside the University campus.

In honour of the late Prof. R. Ramakumar, the founder Professor and Head, the department has instituted the Professor R. Ramakumar Memorial Endowment Lecture. The endowment lecture is held biannually and will be delivered by eminent demographers in India. Started in the year 2003, six endowment lectures have already been conducted. The prominent speakers of the endowment lecture include Dr Vijayanunni, former Registrar General of India, Dr P. H. Reddy, former Director, Population Research Centre, Bangalore, Prof. Arvind Pandey, Director, National Institute of Medical Statistics, New Delhi and Prof. K. Srinivasan, former Director, International Institute for Population Sciences, Mumbai.

UNIVERSITY OF KERALA

Syllabus for M.Sc. Actuarial Science

Programme Specific Outcomes (PSO) for M.Sc. Actuarial Science	
PSO 1	Summarize the high level of knowledge on the Actuarial theory and practice.
PSO 2	Construct the ability to become efficient decision-makers when they have to occupy positions where actuarial expertise and risk theory are essential components.
PSO 3	Organize the ability to disseminate acquired knowledge by acting as resource persons for imparting such knowledge to others.
PSO 4	Make use of knowledge as a foundation for developing professional skills to promote the public interest.
PSO 5	Analyze the economic cost of risk and uncertainty using actuarial models and develop insurance policies that minimize the cost of risk
PSO 6	construct the solid grounding for further intensive studies and research which are now highly in demand in the field of insurance, banking, investment, financial services, risk management, regulatory needs etc...
PSO 7	Describe the mathematical, statistical, financial and economic theories and solving the actuarial issues.

Programme Structure of M.Sc. Actuarial Science

Semester	Course Code	Name of the course	CC	DSE	GC	Credit
I	DAS-CC-511	Foundations of Financial Mathematics	+			4
	DAS -CC-512	Actuarial Statistics I	+			4
	DAS -CC-513	Business Economics I	+			4
	DAS CC-514	Principles of Insurance	+			4
	DAS -DE-515	Role of Actuaries in Insurance and other sectors		+		2
II	DAS -CC-521	Applications of Financial Mathematics	+			4
	DAS -CC-522	Life and Other Contingencies I	+			2
	DAS -CC-523	Actuarial Statistics II	+			4
	DAS -CC-524	Business Economics II	+			4
	DAS -CC-525	Data Management and Analysis using Microsoft Excel	+			2
	DAS -DE-526	Reinsurance		+		2
III	DAS -CC-531	Life and Other Contingencies II	+			4
	DAS -CC-532	Risk Modelling	+			4
	DAS -CC-533	Business Finance	+			4
	DAS -CC-534	Actuarial Data Analysis and Computing in R	+			2
	DAS -CC-535	Demographic methods for Actuarial Science	+			4
	DAS -DE-536	Risk Management		+		2
IV	DAS -CC-541	Actuarial Practice	+			4
	DAS -CC-542	Practice of insurance in the Indian context	+			4
	DAS -CC-543	Dissertation	+			6
	DAS - CC -544	Data Analysis using SPSS		+		2
Generic Courses	DAS -GC-501	Actuarial Science			+	2
	DAS -GC-502	Data Analysis using SPSS			+	2

Semester	Course Code	Course Name	Credits
1	DAS-CC-511	Foundations of Financial Mathematics	4

Course Outcomes (CO):

CO1. Describe the scope, structure, and evolution of the actuarial profession globally and in India.

CO2. Construct and interpret basic cash flow models for various financial instruments.

CO3. Apply concepts of time value of money to calculate present and future values using simple, compound, and effective interest rates.

CO4. Analyze the relationship between different interest rate conventions including nominal, effective, and force of interest.

CO5. Distinguish between real and money rates of interest and evaluate their significance under inflationary/deflationary conditions.

CO6. Calculate present values of cash flows and annuities under different interest scenarios, including deferred and p-thly payable annuities.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1:	PSO 1, PSO 7	R, U	F, C
CO2:	PSO 2, PSO 5, PSO 7	U, Ap	C, P
CO3:	PSO 1, PSO 5, PSO 7	U, Ap	C, P
CO4:	PSO 1, PSO 5, PSO 7	An, U	C, P
CO5:	PSO 4, PSO 5, PSO 6	U, E	C, P
CO6:	PSO 2, PSO 5, PSO 7	Ap, An	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Introduction to Actuarial Science, Main subjects involved, Actuarial profession, professional standards and examination, origin and development of the profession, institutions involved, Actuarial profession around the world and actuarial profession in India.

MO1.1: Define actuarial science and its major subject areas. (*Remember*)

MO1.2: Explain the history and global development of the actuarial profession. (*Understand*)

MO1.3: Identify major actuarial institutions and their functions. (*Remember, Understand*)

MO1.4: Outline the examination structure and professional standards for actuaries. (*Understand*)

MODULE II: Cash Flow Models: Cash flow process -- Examples of cash flow scenarios -
- Zero coupon bond , Fixed interest securities, Index linked securities, Cash on deposit,
Equity, Annuity, An Interest only Loan and Repayment Loan.

MO2.1: Construct cash flow diagrams for various financial products. *(Apply)*

MO2.2: Compare different financial instruments based on their cash flow patterns.
(Analyze)

MO2.3: Analyze the implications of different cash flow structures on investments.
(Analyze)

MODULE III: Time value of money: Interest-simple interest, Compound interest,
Accumulation factors -- The principle of consistency -- Present Values -- Discount rates --
Simple discount -- Compound discount -- Effective rates of interest and discount.

Interest Rates: Nominal Rates -- Nominal rates of Interest and discount --Accumulating
and discounting using nominal interest and discount rates.

MO3.1: Differentiate between simple and compound interest. *(Understand)*

MO3.2: Compute present and future values using accumulation and discount factors.
(Apply)

MO3.3: Use nominal and effective rates for discounting and accumulating cash flows.
(Apply)

MODULE IV: The Force of Interest: Accumulating and discounting using force of
interest – Derivation -- Relationships between effective, nominal and force of interest --
Force of interest as a function of time -- Present Values.

MO4.1: Derive the accumulation and discount functions using force of interest. *(Analyze)*

MO4.2: Illustrate the relationship between nominal, effective, and force of interest rates.
(Understand, Analyze)

MO4.3: Interpret time-varying force of interest and its effect on valuation. *(Analyze)*

MODULE V: Real and Money Rates of Interest: Definition of real and money interest
rates - Deflationary conditions - Usefulness of real and money interest rates. Discounting
and Accumulating: Present values of cash flows -- Discrete cash flows, Continuous cash
flows -- Valuing cash flows -- Constant interest rates and sudden changes in interest rates -
Interest income.

MO5.1: Define real and money interest rates and their relationship with inflation.
(Understand)

MO5.2: Assess the implications of inflation/deflation on interest rate choice. *(Evaluate)*

MO5.3: Value discrete and continuous cash flows under constant and changing interest
rates. *(Apply, Analyze)*

MO5.4: Evaluate interest income from various financial cash flow scenarios. *(Evaluate)*

MODULE VI: Level Annuities -- Present Values – Payments made in arrear -- Payment made in advance – Accumulations, Continuously payable annuities - Annuities payable pthly: Present values, Accumulations , Deferred annuities.

MO6.1: Compute present value and accumulation of annuities with different payment timings. (*Apply*)

MO6.2: Determine values for continuously payable and p-thly annuities. (*Apply*)

MO6.3: Analyze the effect of deferral and payment timing on annuity valuation. (*Analyze*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

References:

- • Mark S. Joshi “The Concepts and Practice of Mathematical Finance”, Cambridge University Press, 2nd Edition (2008)
- • Mc Cutcheon and Scott “Introduction to the Mathematics of Finance”, Heinemann Professional Publishing, 1989
- • Paul Wilmott, Sam Howison and Jeff Dewynne “The Mathematics of Financial Derivatives” Cambridge University Press, 1995
- • Ross S.M "An introduction to Mathematical Finance", Cambridge University Press.

Semester	Course Code	Course Name	Credits
1	DAS-CC-512	Actuarial Statistics I	4

Course Outcomes (CO):

CO1 Summarize and interpret data using descriptive statistics and graphical methods.

CO2 Apply the fundamental principles of probability and analyze random variables.

CO3 Identify and use appropriate probability distributions, including the Poisson process, in actuarial contexts.

CO4 Explain and apply the Central Limit Theorem in actuarial analysis and modeling.

CO5 Analyze joint distributions and compute expectations, covariances, and correlations.

CO6 Perform statistical inference, including hypothesis testing and sampling distribution analysis.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	PSO 1, PSO 3	R, U, Ap, An	F, C
CO2	PSO 1, PSO 3	R, U, Ap	C
CO3	PSO 1, PSO 5	U, Ap, An	C, P
CO4	PSO 1, PSO 5	R, U, Ap, An	C
CO5	PSO 1, PSO 5	U, Ap, An	C, P
CO6	PSO 1, PSO 3	U, Ap, E	C, P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Summarizing Data and Descriptive Statistics - Measures of central tendency (mean, median, mode) and measures of spread (standard deviation, range, IQR). Concepts of moments, symmetry, skewness (Bowley's, Pearson's, and moments-based), and visual summaries like boxplots are included.

MO1.1: Define and compute measures of central tendency and dispersion. (*R, U*)

MO1.2: Interpret graphical summaries and detect skewness and outliers. (*U, Ap*)

MO1.3: Calculate and interpret moments and skewness measures. (*Ap, An*)

MODULE II: Probability and Random Variables - Introduces basic probability concepts including the addition rule and conditional probability. Covers discrete and continuous random variables, their probability functions, cumulative distribution functions (CDFs), and properties. Expectation, mean, variance, and moments of random variables and their linear functions are also discussed.

MO2.1: Define probability and apply basic rules including conditional probability. (*R, Ap*)

MO2.2: Distinguish between discrete and continuous random variables. (*U*)

MO2.3: Derive mean, variance, and moments of random variables. (*Ap, An*)

MODULE III: Probability Distributions and Poisson Process - Focuses on important discrete distributions (binomial, geometric, negative binomial, Poisson, etc.) and continuous distributions (uniform, exponential, gamma, beta, and normal).

MO3.1: Recognize and apply major discrete and continuous probability distributions. (*U, Ap*)

MODULE IV: Central Limit Theorem and Statistical Applications - Presents the Central Limit Theorem (CLT), its significance, and practical uses. Discusses normal approximations for binomial, Poisson, and gamma distributions with continuity corrections. Examples and applications demonstrate how CLT supports statistical inference.

MO4.1: State and explain the Central Limit Theorem and its assumptions. (*R, U*)

MO4.2: Apply normal approximations using continuity corrections. (*Ap*)

MO4.3: Illustrate the importance of CLT in sampling and modeling. (*U, An*)

MODULE V: Joint Distributions and Expectation - Introduces joint probability distributions in discrete and continuous cases, including marginal and conditional distributions. Covers concepts of independence, covariance, correlation, and the use of expectations for functions of two variables.

MO5.1: Define and derive joint, marginal, and conditional distributions. (*U, Ap*)

MO5.2: Compute expectations, covariances, and correlations. (*Ap*)

MO5.3: Use generating functions to model linear combinations of random variables. (*Ap, An*)

MODULE VI: Conditional Expectation and Statistical Inference - Introduces sampling methods, inference for population parameters, and distributions of sample mean and variance. The use of the t-distribution and F-distribution for hypothesis testing in normally distributed samples is also addressed.

MO6.1: Compute conditional expectations and variances. (*Ap*)

MO6.2: Explain sampling distributions and the role of t and F tests. (*U, Ap*)

MO6.3: Conduct basic statistical inference using parametric techniques. (*Ap, E*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics

- Quiz

References:

- • Chin Long Chiang “Statistical Methods of Analysis” World Scientific Books, 2003
- • Dekking, F.M., Kraaikamp, C., Lopuhaa, H.P., Meester, L.E., “A Modern Introduction to Probability and Statistics” Springer Text Series, 2nd Edition
- • Patrick Bocket Arnold Levine Saunders “Statistics and Probability and their applications, College publications, USA
- • Gupta S.C, V.K Kapoor, “Fundamentals of Applied Statistics”, Sultan Chand and Sons, New Delhi
- • Gupta S.C, V.K Kapoor, “Fundamentals of Mathematical Statistics”, Sultan Chand and Sons, New Delhi

Semester	Course Code	Course Name	Credits
1	DAS-CC-513	Business economics I	4

Course Outcomes (CO):

- CO1** Understand fundamental economic concepts, including scarcity, opportunity cost, and economic systems.
- CO2** Analyze demand and supply mechanisms and determine market equilibrium under various scenarios.
- CO3** Apply elasticity and consumer behaviour theories to real-world economic and business decisions.
- CO4** Evaluate cost structures, production decisions, and revenue strategies for firms in different time horizons.
- CO5** Distinguish between market structures and assess firm strategies under perfect and imperfect competition.
- CO6** Analyze marketing techniques and pricing strategies in relation to product differentiation and lifecycle stages.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1	PSO 1, PSO 6	R, U	F, C
CO2	PSO 1, PSO 7	U, Ap, An	C, P
CO3	PSO 1, PSO 2, PSO 5	Ap, An, E	C, P
CO4	PSO 1, PSO 6, PSO 7	U, Ap, An	C, P
CO5	PSO 1, PSO 5, PSO 7	U, An, E	C, P
CO6	PSO 1, PSO 2, PSO 5	U, Ap, An, E	C, P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

Module I: Introduction to Economics and Economic Systems -Fundamental concepts of economics, focusing on what economists study, the problems of scarcity, and the need for economic choices. It explains the distinction between microeconomics and

macroeconomics and introduces business economics in the context of decision-making. The concepts of the production possibility curve and the circular flow of goods and income are covered to illustrate opportunity cost and the functioning of economies. Various types of economic systems, including market, planned, and mixed economies, are discussed. The module also examines major schools of economic thought, such as the classical approach, Marxist socialism, different branches of Keynesian economics (Neo-Keynesians, Post-Keynesians, and New-Keynesians), the monetarist approach, the new classical school, and the Austrian school.

MO1.1: Define key economic concepts including scarcity and opportunity cost. (*R, U*)

MO1.2: Differentiate between microeconomics, macroeconomics, and business economics. (*U*)

MO1.3: Analyze circular flow and economic systems. (*U, An*)

MO1.4: Explain and compare classical, Marxist, Keynesian, monetarist, and Austrian economic schools. (*U, An*)

Module II: Demand, Supply, and Price Mechanism -Foundational principles of demand and supply, including their definitions, determinants, and the relationships between price and quantity. The concepts of demand and supply curves are explained along with distinctions between movements along the curves and shifts of the curves. The module also focuses on market equilibrium, including how equilibrium price and quantity are determined, how markets respond to external shocks, and how incentives influence economic agents within the price mechanism.

MO2.1: Define and interpret demand and supply functions. (*R, U*)

MO2.2: Analyze determinants and graph movements vs shifts in curves. (*U, An*)

MO2.3: Determine equilibrium price and output using graphical and numerical methods. (*Ap, An*)

Module III: Elasticity and Consumer Behaviour -Elasticity concepts including price elasticity of demand and supply, income elasticity, and cross elasticity. It examines how businesses use elasticity measures for decision-making and discusses the influence of time, expectations, and speculation on market responses. It also includes policy tools such as price controls, indirect taxes, and subsidies. The second part of the module delves into consumer behaviour, covering marginal utility theory, timing of costs and benefits, indifference analysis, and consumer choice under risk and uncertainty. The role of utility in insurance and the emerging field of behavioural economics are also discussed.

MO3.1: Calculate price, income, and cross elasticities of demand. (*Ap*)

MO3.2: Apply elasticity concepts to taxation, subsidies, and business strategy. (*Ap, E*)

MO3.3: Evaluate utility, risk, and consumer choice models under uncertainty. (*An, E*)

MO3.4: Explain behavioural economic insights in consumer decision-making. (*U, An*)

Module IV: Production, Costs, and Revenues -Theory of production and costs. It discusses the meaning and types of costs, production in the short and long run, and the nature of cost curves over different time horizons. Concepts of revenue—total, average, and marginal—are introduced and linked to the goal of profit maximization. The module further explores how firms make decisions regarding scale of production and evaluates economies and diseconomies of scale in both short- and long-run contexts.

MO4.1: Differentiate between short-run and long-run production and cost concepts. (*U, An*)

MO4.2: Calculate and interpret cost and revenue curves. (*Ap*)

MO4.3: Analyze profit maximization decisions under different cost structures. (*An, E*)

Module V: Market Structures and Strategic Behaviour - In-depth look at various market structures. It begins with perfect competition, its assumptions, and firm equilibrium in the short and long run. Monopoly is then analyzed, including pricing and output decisions, barriers to entry, and its implications for public interest. Monopolistic competition is explored through firm-level analysis and comparisons with other structures. Finally, the module introduces oligopoly, including collusive and non-collusive forms, and introduces basic game theory as a tool for understanding strategic behaviour in such markets.

MO5.1: Explain features and outcomes under perfect competition, monopoly, and monopolistic competition. (*U, An*)

MO5.2: Compare firm behaviour and efficiency across market structures. (*An, E*)

MO5.3: Apply basic game theory to strategic firm behaviour in oligopoly. (*Ap, An*)

Module VI: Pricing Strategies, Marketing, and Product Life Cycle -How firms set prices in various competitive environments. It discusses product differentiation, the importance of marketing, and the role of advertising. Pricing strategies such as cost-based pricing, limit pricing, and the different types of price discrimination (first, second, and third degree) are explored. The module also explains pricing methods for firms offering multiple products, considering interrelated demand and production. Finally, it introduces the concept of pricing throughout a product's life cycle and emphasizes the influence of market power and elasticity in determining optimal pricing policies.

MO6.1: Describe methods of product marketing and advertising. (*U*)

MO6.2: Analyze pricing strategies including price discrimination and life cycle pricing.

(An, Ap)

MO6.3: Evaluate pricing in cases of interrelated products and demand. (Ap, E)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

References:

- John Sloman, Kevin Hinde and Dean Garrat, “Economics for Business”, Sixth edition, Pearson, 2012
- Gerge.G.Kaufman, “Market discipline in Banking: Theory and Evidence”, Amsterdam, Elsevier, 2003
- Grey Halseth, Sean Markey and David Bruce, “The Next Rural Economics constructing rural place in global economics” UK, CABI, 2010.
- Pinkil Shah, Jaydip Chaudhari, “Effect of Zodiac Signs and planets on Indian Stock market”, New Delhi, Astral International Pvt.Ltd, 2014.
- Shirine Rathore, Muneesh Kumar, Amitabh Gupta, “Indian Capital Market An Empirical study”, New Delhi, Anmol publications Pvt.Ltd, 2003.

Semester	Course Code	Course Name	Credits
1	DAS-CC-514	Principles of Insurance	4

Course Outcomes (COs)

- CO1** Understand the fundamentals of insurance, its historical context, and its role in economic and social security systems.
- CO2** Explain and apply core insurance principles and legal doctrines underlying modern insurance contracts.
- CO3** Describe the structure, features, and types of life insurance products and group schemes.
- CO4** Analyze the workings of health insurance contracts, including risk elements and pricing influences.
- CO5** Identify the structure and features of general insurance products, including marine and fire insurance.
- CO6** Understand the scope of specialized insurance products including pension, travel, credit, and employee benefit-related insurance.

Tagging course outcomes:

CO	Relevant PSOs	CL	KC
CO1	PSO 1, PSO 4	R, U	F, C
CO2	PSO 1, PSO 3, PSO 5	U, Ap, An	C, P
CO3	PSO 1, PSO 2, PSO 5	U, Ap	C, P
CO4	PSO 1, PSO 5, PSO 6	U, Ap, An, E	C, P
CO5	PSO 1, PSO 5	U, Ap, An	C, P
CO6	PSO 1, PSO 5, PSO 7	U, Ap, E	C, P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

MODULE I: Brief Introduction on origin of insurance and its current applications, Concept of insurance, Understanding how insurance works, The role of insurance in economic development and social security, Role of intermediaries, role of specialist.

MO1.1: Describe the origin, evolution, and significance of insurance. (*R, U*)

MO1.2: Explain how insurance functions in society and the economy. (*U*)

MO1.3: Identify the roles of intermediaries and specialists in the insurance ecosystem. (*U, Ap*)

MODULE II: Modern Insurance – Principle of Indemnity and Guarantee- Insurable Interest- Principle of Utmost Good faith- Insurance is a Contract - the basics of insurance contract- Principle of Equity, principle of subrogation.

MO2.1: Explain key insurance principles including indemnity, utmost good faith, and insurable interest. (*U*)

MO2.2: Understand insurance as a legal contract and interpret basic elements of insurance agreements. (*U, Ap*)

MO2.3: Apply principles such as subrogation and equity in practical insurance contexts. (*Ap, An*)

MODULE III: Life Insurance contracts- Products offered by life insurance, types of life insurance plans and group life insurance Schemes.

MO3.1: Describe the features and benefits of different life insurance products. (*U*)

MO3.2: Classify life insurance plans such as term, whole life, and endowment. (*U, Ap*)

MO3.3: Understand group life schemes and their applications. (*U*)

MODULE IV: Health Insurance Contracts – history, how it works?, Moral hazard, common complaints of private insurance, other factors affecting insurance prices.

MO4.1: Trace the history and evolution of health insurance. (*U*)

MO4.2: Explain how health insurance functions and identify moral hazard concerns. (*U, Ap*)

MO4.3: Analyze issues such as complaints, adverse selection, and pricing variations. (*An, E*)

MODULE V: General Insurance Contracts- Products offered by non- life insurance companies, features of marine insurance and fire insurance products.

MO5.1: Identify key general insurance products offered by non-life insurers. (*U*)

MO5.2: Explain the features of marine and fire insurance products. (*U, Ap*)

MO5.3: Compare life and non-life insurance contracts. (*An*)

MODULE VI: Pension and Employee Benefit contracts, Burglary insurance, Wedding insurance, Travel insurance, Workers compensation, Credit insurance

MO6.1: Explain the need and structure of pension and employee benefit schemes. (*U*)

MO6.2: Describe specialized insurance contracts like burglary, travel, wedding, and credit insurance. (*U*)

MO6.3: Assess the importance of non-traditional insurance products in personal and business risk management. (*Ap, E*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

References:

- Ben G Baldwin “The New Life Insurance Investment Advisor” 2nd Edition, Mc Graw Hill
- Harriett E Jones “Principles of Insurance “FLMI Insurance Education Programme, Life Management Institute LOMA, (Dec 1995)
- Neelam C Gulati “Principles of Insurance Management”, Excel Books, New Delhi, (2007)
- Robert I Mehr “Principles of Insurance “Richar D Irwin (Ed.), 8th Edition, 1985

Semester	Course Code	Course Name	Credits
1	DAS-DE-515	Role of Actuaries in Insurance and other sectors	2

Course Outcomes (COs)

- CO1 Explain the role of actuaries in pricing, reserving, underwriting, and solvency within life insurance.
- CO2 Describe actuarial responsibilities in general insurance including loss reserving and risk modeling.
- CO3 Apply actuarial principles to health insurance product design, reserving, and risk stratification.
- CO4 Evaluate actuarial approaches in managing pension liabilities and employee benefit schemes.
- CO5 Demonstrate understanding of actuaries' roles in enterprise risk management and capital modeling.
- CO6 Identify emerging actuarial practice areas including InsurTech, climate risk, and financial reporting standards like IFRS 17.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	PSO1, PSO3	U, Ap, An	C, P
CO2	PSO1, PSO5	U, Ap	C, P
CO3	PSO1, PSO5	Ap, An, E	C, P
CO4	PSO1, PSO5	Ap, An	C, P
CO5	PSO1, PSO5	U, Ap, E	C, P
CO6	PSO2, PSO4	U, An	C, M

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Role of Actuaries in Life Insurance - Overview of actuaries' involvement in life insurance companies. Estimating unpaid claim liabilities. Premium pricing and

valuation of future benefits. Surrender value and maturity benefit calculations.

Underwriting support and solvency margin assessments.

MO1.1: Describe the role of actuaries in life insurance operations. (U)

MO1.2: Calculate reserves and surrender values. (Ap)

MO1.3: Assess solvency margins and support underwriting decisions. (An)

MODULE II: Role of Actuaries in General Insurance - Responsibilities in short-term risk products (motor, fire, marine). Reserving for incurred but not reported (IBNR) claims. Pricing and loss forecasting for non-life insurance products. Involvement in reinsurance structuring and solvency monitoring.

MO2.1: Explain actuarial involvement in short-term insurance products. (U)

MO2.2: Estimate IBNR and loss reserves using actuarial techniques. (Ap)

MO2.3: Design pricing models for general insurance products. (Ap)

MODULE III: Role of Actuaries in Health Insurance - Product development and benefit design. Pricing and reserving techniques for health plans. Estimating solvency margins in health portfolios. Utilization trend forecasting and risk adjustment. Health risk stratification and cost containment.

MO3.1: Apply actuarial techniques in health product pricing and reserving. (Ap)

MO3.2: Forecast trends in health utilization and assess risk adjustment. (An)

MO3.3: Evaluate solvency and cost containment strategies in health insurance. (E)

MODULE IV: Role of Actuaries in Pension and Employee Benefit Schemes -

Valuation of private pensions and social security systems. Funding strategies for defined benefit (DB) schemes. Compliance with regulatory solvency requirements. Application of stochastic asset-liability models. Designing post-retirement medical and benefit plans.

MO4.1: Value pension obligations using actuarial models. (Ap)

MO4.2: Analyze funding and solvency requirements of DB pension schemes. (An)

MO4.3: Apply asset-liability modeling in pension management. (Ap)

MODULE V: Role of Actuaries in Enterprise Risk Management (ERM) - Functions of actuaries as Chief Risk Officers (CROs). Risk identification, measurement, and modeling. Capital adequacy and stress testing. Valuation and execution of risk mitigation strategies. Development of risk appetite frameworks and policies.

MO5.1: Discuss the responsibilities of actuaries as CROs. (U)

MO5.2: Apply risk quantification and mitigation techniques. (Ap)

MO5.3: Evaluate risk appetite frameworks and capital adequacy. (E)

MODULE VI: Evolving Roles and Emerging Practice Areas - Actuaries in banking, data science, and investment consulting. Applications in microinsurance and climate risk modeling. Role in IFRS 17 implementation and financial reporting. InsurTech, AI, and automation in actuarial practice. Emerging risks: cyber, pandemic, and ESG-related risks.

MO6.1: Identify new roles of actuaries in banking, InsurTech, and data science. (U)

MO6.2: Describe actuarial applications in climate and pandemic risk modeling. (U)

MO6.3: Explain the impact of IFRS 17 on actuarial reporting. (U, An)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

References:

- Anderson.A.W, Pension Mathematics for Actuaries
- A.Standstorm, Solvency models, assessment & Regulation.

Semester	Course Code	Course Name	Credits
2	DAS-CC-521	Applications of Financial Mathematics	4

Course Outcomes (CO):

CO1 Understand and apply advanced annuity concepts, including increasing, decreasing, varying, and continuous annuities.

CO2 Solve financial problems involving equations of value, unknown variables, and interest rate estimation.

CO3 Prepare and interpret amortization schedules and calculate loan elements using retrospective and prospective methods.

CO4 Evaluate credit options and project cash flows using appraisal techniques such as NPV, IRR, and payback.

CO5 Compare investment projects under differential interest rates and assess viability based on financial and non-financial metrics.

CO6 Analyze the structure and pricing of bonds, equities, and fixed interest securities under different term structures.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1	PSO 1, PSO 5, PSO 7	R, U, Ap	C, P
CO2	PSO 1, PSO 2, PSO 5, PSO 7	U, Ap, An	C, P
CO3	PSO 1, PSO 5, PSO 7	U, Ap, Cr	C, P
CO4	PSO 1, PSO 5, PSO 7	Ap, E	P
CO5	PSO 1, PSO 2, PSO 5, PSO 7	An, E	C, P
CO6	PSO 1, PSO 5, PSO 7	U, An, Ap	C, P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Increasing annuities --Varying annuities -- Annual payments -- Continuously payable annuities Decreasing Annuities – Special Cases --Irregular payments.

MO1.1: Define increasing, decreasing, and varying annuities. (*Remember, Understand*)

MO1.2: Compute present and future values of annuities with different payment structures. *(Apply)*

MO1.3: Analyze annuities with irregular and continuous payments. *(Analyze)*

MODULE II: Equations of Value: The equation of value and the yield on a transaction – The theory – Solving for an unknown quantity. Solving for the amount of a payment (D or R), Solving for the timing of a payment, Estimating an unknown interest rate using linear interpolation.

MO2.1: Explain the equation of value and yield on a transaction. *(Understand)*

MO2.2: Solve for unknown payments, timing, and rates in financial transactions. *(Apply)*

MO2.3: Estimate unknown interest rates using linear interpolation. *(Apply, Analyze)*

MODULE III: Loan Schedule: Calculating the capital outstanding – Introduction --The theory prospective and retrospective loan calculations .Calculating the Interest and Capital Elements -- The loan schedule -- Instalments payable more frequently than annually.

MO3.1: Describe loan repayment methods and their theoretical foundations. *(Understand)*

MO3.2: Calculate capital outstanding, interest, and principal components. *(Apply)*

MO3.3: Develop loan amortization schedules including frequent instalments. *(Apply, Create)*

MODULE IV: Consumer Credit: Flat Rates and APRs. Project Appraisal- Introduction – Estimating cash flows – Fixed interest rates -- Accumulated value, Net present value and internal rate of return -- Discounted payback period.

MO4.1: Compare flat rate and APR in consumer credit. *(Understand, Analyze)*

MO4.2: Estimate cash flows and apply NPV and IRR methods for project evaluation. *(Apply)*

MO4.3: Evaluate investment worthiness using discounted payback period. *(Evaluate)*

MODULE V: Project appraisal-, comparison of two investment projects – Different interest rates for lending and borrowing – Payback period - Other considerations.

MO5.1: Compare investment projects with varying lending and borrowing rates. *(Analyze, Evaluate)*

MO5.2: Analyze effects of payback period and other financial criteria in project selection. *(Evaluate)*

MO5.3: Assess non-financial aspects in project investment decisions. *(Evaluate)*

MODULE VI: Bonds Equity And Property -- Fixed interest securities – Term structure of interest rates-Discrete time rates- Discrete time spot rates, Discrete time forward rates, Continuous time rates- Continuous time spot rates, Continuous time forward rates, Instantaneous forward rates.

MO6.1: Explain fixed income securities and bond pricing. (*Understand*)

MO6.2: Differentiate between spot, forward, and instantaneous rates under discrete and continuous time. (*Understand, Analyze*)

MO6.3: Apply term structure models for evaluating investment returns. (*Apply, Analyze*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

References:

- Mark S. Joshi “ The Concepts and Practice of Mathematical Finance”, Cambridge University Press, 2nd Edition (2008)
- Mc Cutcheon and Scott “Introduction to the Mathematics of Finance”, Heinemann Professional Publishing, 1989
- Paul Wilmott, Sam Howison and Jeff Dewynne “The Mathematics of Financial Derivatives” Cambridge University Press, 1995
- Ross S.M " An introduction to Mathematical Finance", Cambridge University Press

Semester	Course Code	Course Name	Credits
2	DAS-CC-522	Life and Other Contingencies Part I	2

Course Outcomes (CO):

CO1 Construct and interpret life tables and calculate life probabilities, including select and ultimate mortality.

CO2 Model competing risks using multiple state models and decrement tables relevant to life and health insurance.

CO3 Evaluate expected present values and variances for whole life and term assurance contracts.

CO4 Analyze and compute expected values for pure endowment, endowment assurance, and deferred assurance benefits.

CO5 Assess benefits payable immediately on death and compute their actuarial values.

CO6 Calculate and analyze present values and variances of term and endowment assurance with immediate benefits.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1, 5, 7	U, Ap	F, C, P
CO2	1, 2, 5	U, Ap, An	C, P
CO3	1, 5, 7	Ap, An, E	P
CO4	1, 5, 7	Ap, An, E	P
CO5	1, 5, 7	Ap, E	C, P
CO6	1, 5, 7	Ap, An, E	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: The life table - Constructing a life table - the force of mortality - Interpretation - Using the life table - Life random variables - More notation - Evaluating probabilities without use of the life table Select mortality - Mortality rates that depend on both age and duration - Displaying select rates - Constructing select and ultimate life tables - Using tabulated select life table functions.

MO1.1: Construct life tables and explain their components and interpretation.

(Understand, Apply)

MO1.2: Define and interpret the force of mortality and its applications. *(Understand)*

MO1.3: Use life random variables and evaluate probabilities without direct reference to the life table. *(Apply)*

MO1.4: Explain and apply select mortality, including construction and use of select and ultimate life tables. *(Understand, Apply, Analyze)*

MODULE II: Competing risks- Health insurance contracts- varieties, Multiple state models- notation, Multiple decrement tables, associated single decrement tables, relationships between single and multiple decrement tables, constructing a multiple decrement table.

MO2.1: Define competing risks and describe their relevance in health insurance models.

(Understand)

MO2.2: Use standard notation to represent multiple state models and their transitions.

(Understand, Apply)

MO2.3: Construct and analyze multiple decrement tables and their associated single decrement counterparts. *(Apply, Analyze)*

MO2.4: Derive relationships between single and multiple decrement probabilities.

(Analyze)

MODULE III: Life assurance contracts-Define various assurance contracts- Whole life assurance contracts- present value random variable, Expected present value, Actuarial notation for expected present value, variance of the present value random variable. Term assurance contracts- present value random variable, Expected present value, Actuarial notation for expected present value, variance of the present value random variable.

MO3.1: Define whole life and term assurance contracts. *(Understand)*

MO3.2: Compute expected present value and variance of the present value random variable for whole life assurance. *(Apply, Analyze)*

MO3.3: Evaluate the actuarial present value and variance for term assurance contracts.

(Apply, Analyze)

MODULE IV: Pure endowment contracts- present value random variable, Expected present value, Actuarial notation for expected present value, variance of the present value random variable. Endowment assurance contracts- present value random variable, Expected present value, Actuarial notation for expected present value, variance of the present value random variable. Deferred assurance benefit: present value random variable, Expected present value, Actuarial notation for expected present value.

MO4.1: Compute expected present value and variance of pure endowment contracts.

(Apply, Analyze)

MO4.2: Calculate actuarial present value and variance for endowment assurance contracts.

(Apply, Analyze)

MO4.3: Analyze and compute present values for deferred assurance benefits. *(Apply, Evaluate)*

MODULE V: Benefits payable immediately on death- present value random variable, Expected present value, Actuarial notation for expected present value, variance of the present value random variable. Whole life assurance- present value random variable, Expected present value, Actuarial notation for expected present value, variance of the present value random variable.

MO5.1: Define and model benefits payable immediately on death. *(Understand, Apply)*

MO5.2: Compute present value and expected value of immediate whole life assurance benefits. *(Apply, Analyze)*

MO5.3: Interpret actuarial notations and variance for immediate death benefits. *(Understand, Analyze)*

MODULE VI: Term assurance- present value random variable, Expected present value, Actuarial notation for expected present value, variance of the present value random variable. Endowment assurance- present value random variable, Expected present value, Actuarial notation for expected present value, variance of the present value random variable.

MO6.1: Compute present value, expected value, and variance for term assurance with immediate benefits. *(Apply, Analyze)*

MO6.2: Analyze and evaluate present value and variance for endowment assurance payable immediately on death. (*Apply, Analyze, Evaluate*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

References:

- Alistair Neil “Life Contingencies”, Butterworth-Heinemann Ltd., Illustrated Edition (1977)
- Smith B.H “Contingencies of Value”, Harward University Press, 1988
- Griffith Davis “Table of Contingencies”, Longman & Co, 1825: University of California Library
- Life and Other Contingencies- P F Hooker & L H Longley-Cook – Cambridge – ISBN 0- 521-05327-7
- Michael M Parmenter, “Theory of Interest and Life Contingencies with Pension”, 3rd Edition.

Semester	Course Code	Course Name	Credits
2	DAS-CC-523	Actuarial Statistics II	2

Course Outcomes (CO):

- CO1** Apply estimation techniques using Method of Moments and Maximum Likelihood Estimation (MLE) and evaluate their properties.
- CO2** Construct and interpret confidence intervals for various population parameters under different conditions.
- CO3** Formulate and conduct hypothesis testing using appropriate statistical methods and interpret outcomes.
- CO4** Analyze linear and multivariate data using correlation, regression, and ANOVA models.
- CO5** Apply and evaluate Generalized Linear Models (GLMs) in the context of actuarial and statistical modeling.
- CO6** Implement Bayesian inference using prior and posterior distributions, and apply Bayesian methods to actuarial problems.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1, 5	U, Ap, An, E	C, P
CO2	1, 5	U, Ap	C, P
CO3	1, 3, 5	R, U, Ap, An	C, P
CO4	1, 3	U, Ap, An	C, P
CO5	1, 5	U, Ap, An, E	C, P
CO6	1, 5	U, Ap, E	C, P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Estimation Theory and Confidence Intervals – I -Introduction to point estimation and estimator construction using the **Method of Moments**. Maximum

Likelihood Estimation (MLE): Definition and examples. Properties of estimators:

Unbiasedness, Mean Square Error, and Asymptotic Distributions. Comparison between Method of Moments and MLE.

MO1.1: Explain and apply the Method of Moments and MLE in parameter estimation. (U, Ap)

MO1.2: Evaluate estimator properties: unbiasedness, MSE, and asymptotic distribution. (An, E)

MO1.3: Compare estimation techniques based on theoretical and practical aspects. (An)

MODULE II: Estimation Theory and Confidence Intervals – II - Introduction to

Confidence Intervals (CI): Derivation and interpretation. CI for population **mean** and **variance**, and for **binomial** and **Poisson** parameters using normal approximation. CI for **difference between two means, ratio of variances, and paired data comparisons.**

MO2.1: Derive and interpret confidence intervals for population mean and variance. (Ap, U)

MO2.2: Construct CIs using normal approximation for binomial and Poisson distributions. (Ap)

MO2.3: Calculate CIs for mean difference, ratio of variances, and paired data. (Ap)

MODULE III: Hypothesis Testing - Concepts of **null and alternative hypotheses, simple vs. composite hypotheses.** Type I and Type II errors, **power of a test, significance level, and p-values.** Tests for one sample (mean, variance, binomial/Poisson parameter), and two samples (mean difference, variance ratio, etc.). **Chi-square test and contingency table** applications.

MO3.1: Define hypothesis types and test structures, including errors and significance. (R, U)

MO3.2: Perform tests for population parameters using normal, binomial, and Poisson distributions. (Ap)

MO3.3: Apply chi-square tests for independence and goodness-of-fit. (Ap, An)

MODULE IV: Correlation, Regression, and ANOVA - **Scatter plots, correlation**

analysis (Pearson's and Spearman's), and multivariate correlation. **Simple linear regression:** full model, slope inference, model diagnostics. **One-way ANOVA:** estimation and interpretation. Introduction to **multiple linear regression** models.

MO4.1: Construct and interpret correlation measures and scatter plots. (U, Ap)

MO4.2: Build and evaluate simple and multiple regression models. (Ap, An)

MO4.3: Conduct ANOVA and interpret variance components. (Ap)

MODULE V: Generalized Linear Models (GLM) - Introduction to GLMs and **exponential family distributions**: normal, Poisson, binomial, and gamma. Concepts of **link functions, linear predictors, interaction terms, and categorical variables. Model fitting, residual analysis, and model comparison** techniques.

MO5.1: Identify exponential family distributions and associated link functions. (U)

MO5.2: Fit GLMs using predictors, factors, and interaction terms. (Ap, An)

MO5.3: Analyze residuals and assess model fit. (An, E)

MODULE VI: Bayesian Inference - Introduction to **Bayes' Theorem** in a statistical context. **Prior and posterior distributions**: discrete, continuous, and conjugate priors. Handling **improper priors**, and deriving posterior densities. Applications of Bayesian methods in actuarial analysis.

MO6.1: Apply Bayes' theorem in parameter estimation. (Ap)

MO6.2: Formulate prior, posterior, and conjugate distributions. (U, Ap)

MO6.3: Solve actuarial problems using Bayesian methods. (Ap, E)

References:

- Chin Long Chiang "Statistical Methods of Analysis" World Scientific Books, 2003
- Dekking, F.M., Kraaikamp, C., Lopuhaa, H.P., Meester, L.E., "A Modern Introduction to Probability and Statistics" Springer Text Series, 2nd Edition
- Patrick Bocket Arnold Levine Saunders "Statistics and Probability and their applications", College publications, USA
- Gupta S.C, V.K Kapoor, "Fundamentals of Applied Statistics", Sultan Chand and Sons, NewDelhi
- Gupta S C, V.K Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, NewDelhi

Semester	Course Code	Course Name	Credits
2	DAS-CC-524	Business Economics II	2

Course Outcomes (CO):

- CO1** Understand foundational economic concepts, including scarcity, market systems, and the role of incentives.
- CO2** Analyze demand, supply, elasticity, and consumer behaviour in relation to business decision-making.
- CO3** Evaluate firm behaviour across various market structures and apply pricing and marketing strategies.
- CO4** Apply macroeconomic theories to explain national income, inflation, unemployment, and business cycles.
- CO5** Compare macroeconomic schools of thought and analyze the effectiveness of demand- and supply-side policies.
- CO6** Assess the integration of fiscal and monetary policies and their impact on macroeconomic stability.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1	PSO 1, PSO 6	R, U	F, C
CO2	PSO 1, PSO 5, PSO 6	U, Ap, An	C, P
CO3	PSO 1, PSO 2, PSO 5	Ap, An, E	C, P
CO4	PSO 1, PSO 5, PSO 7	U, An, Ap	C, P
CO5	PSO 1, PSO 2, PSO 6	U, An, E	C, P
CO6	PSO 1, PSO 5, PSO 7	Ap, An, E	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

Module I: Keynesian Macroeconomics and the Determination of National Income -

Introduces the Keynesian perspective on macroeconomic issues, focusing on how national income is determined in an economy. It explores the Keynesian model of income

determination and explains the concepts of unemployment and inflation within the Keynesian framework. The analysis extends to the business cycle, addressing fluctuations in output, employment, and inflation. The module emphasizes the role of aggregate demand in short-run economic performance and explains how deviations from full employment arise due to demand-side shocks.

MO1.1: Define scarcity, opportunity cost, and basic economic concepts. (*R, U*)

MO1.2: Distinguish between microeconomics, macroeconomics, and business economics. (*U*)

MO1.3: Interpret circular flow diagrams and economic systems. (*U, Ap*)

MO1.4: Compare major economic schools of thought. (*U, An*)

Module II: Monetarist and New Classical Perspectives - Discusses alternative macroeconomic schools of thought, including the monetarist and new classical approaches. It presents the expectations-augmented Phillips Curve and analyzes how inflation and unemployment are interpreted by monetarists. The new classical emphasis on rational expectations is explored, especially in contrast with the adaptive expectations used in early Keynesian models. The Keynesian response to these critiques is also examined, offering a broader perspective on how different schools interpret macroeconomic instability and the effectiveness of policy.

MO2.1: Define and analyze demand and supply curves. (*U, Ap*)

MO2.2: Explain shifts and movements along curves. (*U*)

MO2.3: Determine and graph market equilibrium. (*Ap, An*)

Module III: Goods and Money Market Interactions - Focusing on the relationship between the goods market and the money market, this module explores how monetary and fiscal changes impact national income. Key macroeconomic models such as the **IS-LM model** are introduced to show the equilibrium interaction between interest rates and output in both markets. The module also discusses the **IS-MP model**, which adapts the traditional IS-LM framework to incorporate modern central banking practices, including inflation targeting and interest rate rules. The dynamic interplay of investment, output, money supply, and interest rates is analyzed through these models.

MO3.1: Compute and interpret elasticity measures. (*Ap*)

MO3.2: Evaluate effects of government interventions (taxes, subsidies, price controls).

(An, E)

MO3.3: Analyze consumer choice under uncertainty and behavioural economics principles. *(An, E)*

Module IV: Supply-Side Policies and Structural Reform - Presents supply-side policies aimed at improving the productive potential of the economy. It covers different theoretical approaches to supply-side policy, including the new classical view (emphasizing deregulation and tax incentives), the Keynesian view (supporting public investment and education), and the “third way” which combines market and state interventions. The module explores how market-oriented policies (e.g., privatization, tax cuts) and interventionist policies (e.g., infrastructure spending, urban and regional planning) are used in practice to enhance economic efficiency and long-term growth.

MO4.1: Explain short-run and long-run production and cost structures. *(U, Ap)*

MO4.2: Analyze revenue and profit maximization. *(An, E)*

MO4.3: Compare firm behaviour in different market structures. *(U, An)*

MO4.4: Apply pricing and marketing strategies. *(Ap, E)*

Module V: Fiscal Policy and Public Finances - Fiscal policy is discussed as a key demand-side tool for macroeconomic stabilization. It explains the components of fiscal policy—government spending and taxation—and distinguishes between expansionary and contractionary measures. The uses of fiscal policy in addressing inflation, unemployment, and growth are elaborated with real-world relevance. The policymaking environment, including budget constraints, public debt, and fiscal responsibility, is also analyzed, helping students understand how fiscal tools are constrained by political and institutional realities.

MO5.1: Describe Keynesian income determination and business cycle analysis. *(U)*

MO5.2: Explain monetarist and new classical perspectives on inflation and unemployment. *(U, An)*

MO5.3: Use the IS-LM and IS-MP models to assess macroeconomic equilibrium. *(Ap, An)*

Module VI: Macroeconomic Policy Integration and Application - Integrates the macroeconomic policy tools covered in previous modules and applies them to real-world

issues. It analyzes how fiscal and monetary policies are coordinated to achieve macroeconomic stability, considering trade-offs between inflation, growth, and employment. The role of policy credibility, expectations, and time lags in policy effectiveness is explored. The module concludes with a discussion of policy responses to recent macroeconomic challenges, such as financial crises, pandemics, and inflation surges, offering a comprehensive understanding of applied macroeconomic policy in a dynamic global environment.

MO6.1: Compare approaches to supply-side policies and structural reform. (*U, E*)

MO6.2: Evaluate the use and limitations of fiscal policy. (*Ap, E*)

MO6.3: Assess the coordination of fiscal and monetary policies in addressing real-world economic problems. (*An, E*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

References:

- John Sloman, Kevin Hinde and Dean Garrat, “Economics for Business”, Sixth edition, Pearson, 2012
- Gerge.G.Kaufman, “Market discipline in Banking: Theory and Evidence”, Amsterdam, Elsevier, 2003
- Grey Halseth, Sean Markey and David Bruce, “The Next Rural Economics constructing rural place in global economics” UK, CABI, 2010.
- Pinkil Shah, Jaydip Chaudhari, “Effect of Zodiac Signs and planets on Indian Stock market”, New Delhi, Astral International Pvt.Ltd, 2014.
- Shirine Rathore, Muneesh Kumar, Amitabh Gupta, “Indian Capital Market An Empirical study”, New Delhi, Anmol publications Pvt.Ltd, 2003.

Semester	Course Code	Course Name	Credits
2	DAS-CC-525	Data Management and Analysis using Microsoft Excel	2

Course Outcomes (COs)

CO1 Understand Excel interface and perform basic data entry and worksheet operations.

CO2 Manage ranges and tables, apply sorting and filtering, and use range names effectively.

CO3 Apply formulas and functions for mathematical, text, date-time, and lookup operations.

CO4 Create, format, and modify charts for effective data visualization.

CO5 Import, clean, and validate data for analysis and reporting.

CO6 Generate and use pivot tables for efficient data summarization and insights.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1	PSO 1, PSO 6	R, U, Ap	F, C, P
CO2	PSO 1, PSO 6	U, Ap, An	C, P
CO3	PSO 1, PSO 3, PSO 6	Ap, An	P, C
CO4	PSO 1, PSO 5	Ap, An, E	P, C
CO5	PSO 1, PSO 6, PSO 7	Ap, An, E	P, C
CO6	PSO 1, PSO 5, PSO 7	Ap, An, E	P, C

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

Module I: Overview of excel: Introducing Excel, Entering and editing worksheet data- Exploring data types-numeric, text, date and time, performing basic worksheet operations.

MO1.1: Navigate the Excel interface and perform worksheet data entry. (*R, U*)

MO1.2: Identify and work with different data types (numeric, text, date/time). (*U*)

MO1.3: Execute basic worksheet operations such as editing and formatting cells. (*Ap*)

Module II: Working with excel ranges and tables, Understanding Cells and Ranges, using names to work with ranges, working with tables, sorting and filtering table data.

MO2.1: Define and use cell ranges in Excel. (*U, Ap*)

MO2.2: Utilize named ranges to simplify formulas. (*Ap*)

MO2.3: Create and manage tables, including sorting and filtering data. (*Ap, An*)

Module III: Working with formulas and functions in excel: Introducing formulas and functions, using Cell References in Formulas, using Formulas for Common Mathematical Operations, using formulas to manipulate text, using formulas with date and time, Using Formulas for Matching and Lookups

MO3.1: Construct formulas for arithmetic and logical operations. (*Ap*)

MO3.2: Use built-in functions to manipulate text and dates. (*Ap*)

MO3.3: Apply lookup functions like VLOOKUP, HLOOKUP, and MATCH. (*Ap, An*)

Module IV: Creating charts in excel, basic steps for creating a chart, Modifying and Customizing Charts,

MO4.1: Create charts such as column, line, pie, and bar charts. (*Ap*)

MO4.2: Customize chart elements like titles, axes, and legends. (*Ap*)

MO4.3: Interpret data trends using chart visualizations. (*An, E*)

Module V: Managing and Analyzing Data, Importing Data, Cleaning Up Data, Using Data Validation

MO5.1: Import data into Excel from various sources. (*Ap*)

MO5.2: Clean and transform data for analysis. (*Ap, An*)

MO5.3: Apply data validation rules to control data entry. (*Ap, E*)

Module VI: Pivot Tables- create a pivot table, analyzing data with pivot table.

MO6.1: Create pivot tables to summarize data. (*Ap*)

MO6.2: Use pivot tables for multi-dimensional data analysis. (*Ap, An*)

MO6.3: Derive insights through filtering and rearranging data fields. (*E*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

Semester	Course Code	Course Name	Credits
2	DAS-DE-526	Reinsurance	2

Course Outcomes (CO):

- CO1** Understand the basic nature, functions, and forms of reinsurance, including its significance in insurance operations.
- CO2** Analyze various reinsurance methods such as surplus, quota share, and probable maximum loss, along with their applications.
- CO3** Evaluate reinsurance treaties, both proportional and non-proportional, and determine retention and reinsurer participation.
- CO4** Interpret premium calculations, ceding commissions, and differentiate between commissions to agents and brokers.
- CO5** Examine the structure of the reinsurance industry in India and understand its role in solvency, claim stabilization, and profitability.
- CO6** Apply concepts of reinsurance loss reserving, explore financial reinsurance, and evaluate emerging risk transfer markets.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1	PSO 1, PSO 4	R, U	F, C
CO2	PSO 1, PSO 5, PSO 7	U, Ap, An	C, P
CO3	PSO 1, PSO 2, PSO 5	U, Ap, E	C, P
CO4	PSO 1, PSO 3, PSO 4	U, Ap	C, P
CO5	PSO 1, PSO 6	U, An, E	C, P
CO6	PSO 1, PSO 6, PSO 7	U, Ap, E	C, P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Reinsurance- introduction-Nature of Reinsurance, Background, functions and advantages. Forms of reinsurance- Facultative reinsurance, Treaty reinsurance. Factors affecting reinsurance. “Follow the fortune clause” in reinsurance.

MO1.1: Explain the concept, nature, and background of reinsurance. *(R, U)*

MO1.2: Describe the key functions and advantages of reinsurance. *(U)*

MO1.3: Distinguish between facultative and treaty reinsurance. *(U, Ap)*

MO1.4: Interpret the relevance of the “Follow the fortune” clause. *(U)*

MODULE II: Methods of reinsurance-Surplus reinsurance, Quota share, variable quota share, probable maximum loss method, Law of large numbers.

MO2.1: Explain surplus and quota share reinsurance mechanisms. *(U)*

MO2.2: Analyze variable quota share and probable maximum loss approaches. *(An)*

MO2.3: Apply the law of large numbers in reinsurance contexts. *(Ap)*

MODULE III: Reinsurance treaties-proportional treaty, quota share treaty, non-proportional treaty. Retention and reinsurer’s share. Non-proportional methods of reinsurance-excess of loss cover method, stop loss method.

MO3.1: Differentiate between proportional and non-proportional treaties. *(U, An)*

MO3.2: Evaluate quota share and excess of loss arrangements. *(E)*

MO3.3: Determine insurer retention and reinsurer’s share in treaty design. *(Ap, E)*

MODULE IV: Reinsurance premium, ceding commission. Inception and termination of reinsurance treaty. Distinguish between ceding commission and commission paid to Agents and brokers.

MO4.1: Explain the structure and components of reinsurance premiums. *(U)*

MO4.2: Distinguish between ceding commissions and agent/broker commissions. *(U, Ap)*

MO4.3: Interpret the processes of treaty inception and termination. *(U, Ap)*

MODULE V: Reinsurance in India. Specialist or professional reinsurers, GIC Re, underwriting agencies, stabilization of claims ratio, protection of solvency margin, stabilisation of profitability.

MO5.1: Identify key players in the Indian reinsurance sector, including GIC Re. *(R, U)*

MO5.2: Assess the roles of underwriting agencies and professional reinsurers. *(An)*

MO5.3: Analyze how reinsurance stabilizes solvency margins and claim ratios. *(An, E)*

MODULE VI: Reinsurance loss reserving programme objectives, primary objectives, Alternative risk transfer- finite risk/ financial reinsurance, new markets

MO6.1: Describe the objectives of loss reserving programs. (*U*)

MO6.2: Evaluate the application of financial reinsurance and finite risk models. (*E*)

MO6.3: Explore new and alternative risk transfer markets. (*U, Ap*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

References:

- Harrison, Reinsurance principles and practise.
- Robert.W.Strain, Reinsurance
- IRDA regulations and guidelines on reinsurance.

Semester	Course Code	Course Name	Credits
3	DAS-CC-531	Life and Other contingencies Part II	4

Course Outcomes (CO):

- CO1** Evaluate present values, expected values, and variances of various life annuity contracts using actuarial functions.
- CO2** Analyze and compute expected values for assurance and annuity benefits with variable and m-thly payments under different mortality assumptions.
- CO3** Determine gross premiums using future loss models and apply the principle of equivalence.
- CO4** Calculate prospective and retrospective reserves for various types of life insurance contracts including with-profits policies.
- CO5** Apply joint life and last survivor functions in calculating benefits and describe contingent assurances and reversionary annuities.
- CO6** Perform profit testing for different insurance contracts and evaluate profitability measures including unit-linked reserves.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1	PSO 1, PSO 5, PSO 7	U, Ap, An	C, P
CO2	PSO 1, PSO 2, PSO 5, PSO 7	Ap, An, E	C, P
CO3	PSO 1, PSO 5, PSO 7	U, Ap, E	C, P
CO4	PSO 1, PSO 5, PSO 7	U, Ap, An, E	C, P
CO5	PSO 1, PSO 5, PSO 7	U, Ap, An	C, P
CO6	PSO 1, PSO 5, PSO 7	Ap, An, E	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Life annuity contracts: Whole life annuities payable annually in arrears - Present value random variable - Expected present value - Variance of the present value

random variable - Whole life annuities payable annually in advance - Present value random variable - Variance of the present value random variable - Temporary annuities payable annually in arrears - Present value random variable - Expected present value - Variance of the present value random variable- Temporary annuities payable annually in advance - Present value random variable - Expected present value - Variance of the present value random variable - Deferred annuities - Present value random variable - Expected present value - Deferred annuities-due - Guaranteed annuities payable annually in advance - Present value random variable - Expected present value - Variance of the present value random variable.

MO1.1: Define and evaluate whole life and temporary annuities (in arrears and in advance). (U , Ap)

MO1.2: Compute expected present value and variance for deferred and guaranteed annuities. (Ap , An)

MO1.3: Use actuarial notation to express annuity values and related formulas. (U , Ap)

MODULE II: Evaluation of assurances and annuities: Evaluating assurance benefits - Evaluating annuity benefits - Premium conversion formulae. Expected present values of annuity payable m times each year - Expected present values under a constant force of mortality. Variable benefits and conventional with-profits policies: Variable payments - Payments varying at a constant compound rate - Payment varying by a constant monetary amount - Whole life assurance - Term assurance - Endowment assurance - Decreasing term assurance - Increasing assurances payable immediately on death - Whole life annuity payable in arrears .

MO2.1: Calculate expected present values of various assurances and annuities including m -thly payable ones. (Ap)

MO2.2: Apply premium conversion formulae under different mortality assumptions including constant force. (Ap , An)

MO2.3: Evaluate increasing/decreasing assurances and with-profits policies. (Ap , An , E)

MODULE III: Gross premiums: The gross premiums - Gross future loss random variable - Calculating premiums that satisfy probabilities, using gross future loss random variable. Principle of equivalence.

MO3.1: Define gross future loss random variable and derive gross premium expressions.

(U, Ap)

MO3.2: Apply the principle of equivalence to determine premiums satisfying loss probability constraints. *(Ap, E)*

MODULE IV: Gross premium reserves: Why hold reserves - Prospective reserves - Calculating gross premium reserves - Calculating prospective reserves that satisfy probabilities - Gross premium prospective reserves for conventional with-profits policies - Reserve conventions Retrospective reserves - Retrospective accumulations - Gross premium retrospective reserve Equality of prospective and retrospective reserves.

MO4.1: Define and compute prospective and retrospective reserves. *(U, Ap)*

MO4.2: Apply reserve conventions for with-profits and unit-linked policies. *(Ap, An)*

MO4.3: Prove equality of prospective and retrospective reserves. *(An, E)*

MODULE V: Joint life and last survivor functions- random variable to describe joint life functions, determining simple joint life and last survivor functions. Contingent assurances and reversionary annuities.

MO5.1: Define joint life and last survivor functions using actuarial random variables. *(U, Ap)*

MO5.2: Compute contingent assurances and reversionary annuity benefits. *(Ap, An)*

MODULE VI: Profit testing: Evaluating expected cash flows for various contract types – Examples. Profit test for annual premium contracts - Summary measures of profit - Profit testing using the present value random variable - Pricing using profit test - Profit criterion. Reserving aspects of profit testing: Pricing and reserving bases - Calculating reserves for Unit -linked contracts - Reserves revisited

MO6.1: Analyze cash flows and profit measures for different contracts. *(An, E)*

MO6.2: Perform profit testing using present value random variables. *(Ap, E)*

MO6.3: Evaluate unit-linked reserves and reserving strategies under different pricing bases. *(E)*

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

References:

- Alistair Neil “Life Contingencies”, Butterworth-Heinemann Ltd., Illustrated Edition (1977)
- Smith B.H “Contingencies of Value”, Harward University Press, 1988
- Griffith Davis “Table of Contingencies”, Longman & Co, 1825: University of California Library
- Life and Other Contingencies- P F Hooker & L H Longley-Cook – Cambridge – ISBN 0- 521- 05327-7
- Michael M Parmenter, “Theory of Interest and Life Contingencies with Pension”, 3rd Edition.
- Students will be expected to read relevant papers currently available in the net PFRDA related papers

Semester	Course Code	Course Name	Credits
3	DAS-CC-532	Risk Modelling	4

Course Outcomes (COs)

- CO1 Understand and apply loss distributions and estimation techniques in actuarial modeling.
- CO2 Explain reinsurance mechanisms and assess their impact on claims and reserve modeling.
- CO3 Analyze actuarial risk models and evaluate ruin probabilities under uncertainty.
- CO4 Apply time series and stochastic models for forecasting in actuarial science.
- CO5 Evaluate reserving methods using run-off triangles and adjust for inflation.
- CO6 Use machine learning concepts in actuarial applications and perform model evaluation.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	PSO 1, PSO 5	U, Ap, An, E	C, P
CO2	PSO 1, PSO 5, PSO 6	U, Ap, An	C, P
CO3	PSO 1, PSO 5	Ap, An, E	C, P
CO4	PSO 1, PSO 5	U, Ap, An	C, P
CO5	PSO 1, PSO 6	Ap, An, E	P, C
CO6	PSO 1, PSO 7	U, An, E	C, P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Loss Distributions and Estimation Techniques - Types of loss

distributions: Exponential, Gamma, Normal, Lognormal, Pareto, Weibull, Burr, Estimation

methods: Method of Moments, Maximum Likelihood Estimation (MLE), Method of Percentiles, Goodness-of-fit tests for model validation

MO1.1: Identify and differentiate common loss distributions (U).

MO1.2: Apply MLE, Method of Moments, and Percentile Method to estimate parameters (Ap).

MO1.3: Conduct and interpret goodness-of-fit tests for model validation (An, E).

MODULE II: Reinsurance and Claim Adjustments - Reinsurance types: Proportional and Non-Proportional arrangements, Excess of loss reinsurance for insurer and reinsurer, Application of distributions (Lognormal, Normal) in reinsurance, Impact of inflation, censored data, and policy excess in claims modeling

MO2.1: Explain proportional and non-proportional reinsurance schemes (U).

MO2.2: Evaluate the effect of inflation, censored data, and policy excess on claim estimates (An).

MO2.3: Model claims using Normal and Lognormal distributions under reinsurance contracts (Ap, An).

MODULE III: Risk Models and Ruin Theory - Basic and collective risk models, Compound distributions: Poisson, Binomial, and Negative Binomial, Aggregate claim distributions under various reinsurance schemes, Individual risk model and parameter uncertainty, Ruin theory: surplus process, probability of ruin, and premium loadings, Effect of reinsurance on ruin probabilities

MO3.1: Construct basic and collective risk models using compound distributions (Ap).

MO3.2: Analyze the effect of parameter uncertainty in individual risk models (An).

MO3.3: Calculate ruin probabilities and interpret premium loadings and reinsurance effects (Ap, E).

MODULE IV: Time Series and Forecasting Models - Properties of univariate time series: autocorrelation, stationarity, AR(p), MA(q), and ARMA(p,q) models, ARIMA models for non-stationary series, Backward shift and differencing operators, Introduction to Markov processes

MO4.1: Identify and construct AR(p), MA(q), ARMA, and ARIMA models (U, Ap).

MO4.2: Analyze stationarity and perform transformations using differencing and backshift operators (An).

MO4.3: Understand basics of Markov processes for stochastic modeling (U, Ap).

MODULE V: Reserving and Run-Off Triangle Methods - Introduction to run-off triangles and reserving types, Chain ladder method and other development factor

techniques, Inflation-adjusted chain ladder, Average cost per claim and loss ratio methods, Bornhuetter-Ferguson method and assumptions

MO5.1: Construct and interpret run-off triangles using development factors (Ap).

MO5.2: Apply inflation-adjusted chain ladder and average cost per claim method (Ap, An).

MO5.3: Use the Bornhuetter-Ferguson method and explain its assumptions (Ap, E).

MODULE VI: Machine Learning in Actuarial Applications - Overview of machine learning concepts and loss functions, Model evaluation, generalization error, and regularization, Supervised, unsupervised, semi-supervised, and reinforcement learning, Training-validation-testing framework

MO6.1: Explain core machine learning concepts and model validation strategies (U).

MO6.2: Compare supervised, unsupervised, and reinforcement learning methods (U, An).

MO6.3: Evaluate predictive models and understand overfitting, regularization, and loss functions (E).

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

References:

1. Edward W Frees -Regression Modeling with Actuarial and Financial Applications (International Series on Actuarial Science)
2. Blacker & Yang Actuaries in Micro insurance: Managing Risk for the Underserved ACTEX
3. Miller & Lawton | Stone House-An introduction to statistical modeling – Dobson, Annette J- Chapman & Hall, 1983 viii, 125 pages – ISBN : 0 412 24860 3
4. Hossack,Ian B; Pollard, John H; Zehnwirth, Benjamin -Introductory statistics with applications in general insurance- – 2nd ed. – Cambridge University Press , 1999.
5. Klugman, Stuart A; Panjer, Harry H; Willmot, Gordon E; Venter, Gary G.- John Wiley & Sons -Loss models: from data to decisions. 1998

Semester	Course Code	Course Name	Credits
3	DAS-CC-533	Business Finance	4

Course Outcomes (CO):

- CO1** Understand the basic principles of finance and corporate governance in relation to business objectives.
- CO2** Identify various business structures and comprehend taxation principles relevant to individuals and companies.
- CO3** Analyze sources of long-term finance and capital-raising mechanisms in the financial market.
- CO4** Evaluate short- and medium-term financing tools and the role of financial derivatives in managing risk.
- CO5** Apply working capital management strategies and budgeting techniques for efficient financial planning.
- CO6** Assess corporate growth strategies, including mergers and acquisitions, and their financial implications.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1	PSO 1, PSO 6	R, U, Ap	F, C
CO2	PSO 1, PSO 5	R, U, An, E	C, P
CO3	PSO 1, PSO 6	U, An	C, P
CO4	PSO 1, PSO 5, PSO 7	U, Ap, An, E	C, P
CO5	PSO 1, PSO 6	Ap, An, E	C, P
CO6	PSO 1, PSO 5, PSO 7	U, Ap, An, E	C, P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Introduction to Finance and Business Objectives- Covers the basic principles of finance, the role of finance in organizations, capital budgeting, and

responsibilities of financial decision-makers. It also explains business objectives, stakeholder interests, and the importance of corporate governance in financial decision-making.

MO1.1: Describe key principles of finance and its role in business operations. *(U)*

MO1.2: Explain the significance of capital budgeting and financial decisions. *(U, Ap)*

MO1.3: Understand business objectives, stakeholder interests, and governance practices. *(U, An)*

MODULE II: Business Ownership and Taxation - Introduces types of business entities like sole proprietorships, partnerships, and companies. Discusses the basics of personal and corporate taxation, including tax rates, taxable income, capital gains, and other relevant taxes such as property tax and sales tax.

MO2.1: Identify different forms of business ownership and their advantages. *(R, U)*

MO2.2: Describe the principles of personal and corporate taxation. *(U)*

MO2.3: Evaluate the impact of taxation on business planning and compliance. *(An, E)*

MODULE III: Long-Term Financing and Capital Markets - Focuses on sources of long-term finance including loans, bonds, and share capital. Discusses how companies raise capital through the stock market, different methods of issuing shares, and instruments like convertibles, warrants, and preference shares.

MO3.1: Differentiate between debt and equity instruments used for long-term financing. *(U, An)*

MO3.2: Understand the processes of raising capital through stock markets. *(U)*

MO3.3: Analyze the implications of instruments like convertibles and preference shares. *(An)*

MODULE IV: Short and Medium-Term Finance & Derivatives - Covers short- and medium-term financing options such as bank loans, trade credit, leasing, and factoring. Introduces financial derivatives including futures, options, and swaps, explaining their use in managing financial risk.

MO4.1: Describe various short and medium-term financing sources. *(U)*

MO4.2: Explain the use of derivatives in financial risk management. *(U, Ap)*

MO4.3: Assess the benefits and risks of financial instruments like options and swaps. (*An, E*)

MODULE V: Working Capital Management and Budgeting - Explains how companies manage their cash flow and working capital. Introduces the preparation of budgets and forecasts, discusses dividend policy, and emphasizes the importance of maintaining liquidity in operations.

MO5.1: Manage working capital components such as cash, receivables, and inventory. (*Ap*)

MO5.2: Construct and interpret budgets and financial forecasts. (*Ap, An*)

MO5.3: Analyze the relationship between liquidity, dividend policy, and cash flow. (*An, E*)

MODULE VI: Growth, Mergers, and Acquisitions - Focuses on strategies for company growth, the motives and methods behind mergers and acquisitions, and the financial implications of corporate restructuring. Discusses constraints to growth and how companies manage expansion plans.

MO6.1: Explain motives and methods for corporate growth. (*U, Ap*)

MO6.2: Assess financial implications of mergers and acquisitions. (*An, E*)

MO6.3: Identify constraints on business expansion and evaluate strategic options. (*An, E*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

References:

1. Brealey, R. A., Myers, S. C., Allen, F., & Mohanty, P. (2012). Principles of corporate finance. Tata McGraw-Hill Education.
2. Damodaran, A. (1996). Corporate finance. Wiley.
3. Brigham, E. F., & Houston, J. F. (2012). Fundamentals of financial management. Cengage

Learning.

4. Davidson, A. (2008). How to Understand the Financial Pages: A Guide to Money and the

Jargon. Kogan Page Publishers.

5. Joohnson, T. Palgrave Macmillan, 2017. Ethics in quantitative finance.

Semester	Course Code	Course Name	Credits
3	DAS-CC-534	Actuarial Data Analysis and Computing in R	4

Course Outcomes (CO):

CO1 Understand R programming basics, including data structures, control flow, and functions.

CO2 Apply data import, cleaning, transformation, and management techniques using R.

CO3 Visualize data using basic and advanced graphical techniques in base R and ggplot2.

CO4 Perform descriptive statistical analysis for single and multivariate data using R.

CO5 Conduct inferential statistical tests and regression analysis using R programming.

CO6 Interpret statistical outputs and draw conclusions relevant to actuarial and risk models.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1	PSO 1, PSO 6	R, U, Ap	F, C
CO2	PSO 1, PSO 3, PSO 6	U, Ap, An	C, P
CO3	PSO 1, PSO 5, PSO 6	Ap, An, E	P, C
CO4	PSO 1, PSO 2, PSO 6	Ap, An	P, C
CO5	PSO 1, PSO 6, PSO 7	Ap, E	P, C
CO6	PSO 1, PSO 5, PSO 7	An, E	P, M

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

Module I: Introduction to R: Basic Operations in R; Data Structures in R: Vectors, Matrices, Arrays, Data Frames and Lists. Conditional and Control Flow- Relational Operators, Logical Operators. Functions in R

MO1.1: Understand the R environment and perform basic arithmetic operations. (*R, U*)

MO1.2: Describe and manipulate basic data structures in R (vectors, matrices, arrays, data frames, lists). (*U, Ap*)

MO1.3: Apply relational and logical operators in control flow. (*Ap*)

Module II: Basic operations in R: Conditional and Control Flow- Relational Operators, Logical Operators, Conditional Statements. Functions in R-introduction, writing a function in R, Function scoping- environment, scope, default values, Recursion.

MO2.1: Write and execute conditional statements in R. (*Ap*)

MO2.2: Create user-defined functions and understand function scoping. (*Ap, U*)

MO2.3: Apply recursion and default arguments in R functions. (*Ap*)

Module III: Working with Data: Importing data, entering data, data management- generating new variables, selecting variables, selecting observations, recording variables, replacing variables, renaming variables, changing data types of variables. Merging datasets by variables and observations, sorting dataset, ordering variables.

MO3.1: Import and enter datasets into R. (*U, Ap*)

MO3.2: Generate and manipulate variables; subset and recode data. (*Ap, An*)

MO3.3: Merge, sort, and restructure datasets effectively. (*Ap*)

Module IV: Data visualization: A overview of R graphics, Basic graphs- Histogram, Bar charts, Box Plots, Scatter plots. Understanding ggplot2- univariate and bivariate graphs

MO4.1: Create standard visualizations such as histograms, bar charts, box plots, and scatter plots. (*Ap*)

MO4.2: Use **ggplot2** to produce univariate and bivariate graphical representations. (*Ap, An*)

MO4.3: Interpret visual patterns to understand data structure and trends. (*An, E*)

Module V: Basic Statistics: Probability distributions, Descriptive statistics tendency of a distribution, measures of spread, descriptive statistics for multiple variables, frequency distribution, and cross-tabulation

MO5.1: Compute and interpret central tendency and dispersion measures. (*Ap*)

MO5.2: Generate frequency distributions and crosstabs for categorical variables. (*Ap, An*)

MO5.3: Summarize multivariate descriptive statistics using R. (*An, E*)

Module VI: Statistical Analysis: Bivariate inferential statistics- One sample T-test, Paired T-tests, Independent T-tests, ANOVA, Goodness of fit, tests for independence of attributes, correlation and regression.

MO6.1: Conduct t-tests (one sample, paired, independent) and ANOVA. (*Ap, E*)

MO6.2: Apply Chi-square tests for goodness-of-fit and independence. (*Ap*)

MO6.3: Perform correlation and linear regression analyses. (*Ap, E*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

Semester	Course Code	Course Name	Credits
3	DAS-CC-535	Demographic methods for Actuarial Science	4

Course Outcomes:

CO1: Understand the components of population composition

CO2: Can identify errors in demographic data

CO3: Summarise population composition and components of population change

CO4: Analyze the structure of populations

CO5: Understand the factors influencing population growth

CO6: Apply methods of population estimation and projection

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1	U	C
CO2	1	U	C
CO3	1	U	C
CO4	1, 3	U, E	C
CO5	1, 3	A	P
CO6	1,3	U, A	P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSECONTENT:

Module I: Introduction: Concepts and Definitions of terms- fertility, mortality- Nuptiality- Migration-Urbanization- Structure of Population: Measures of Age and Sex Composition of the Population Age - pyramid

Module Outcomes:

1. Explain the key demographic concepts (understand).
2. Describe the various measures of age and sex structure in a population and the types of errors commonly found in demographic data (Understand).
3. Analyze age-sex pyramids (Analyze)

Module II: Population Growth: Measures of Population growth – Balancing Equation Arithmetic- Geometric- Exponential - Doubling Time- Rates and Ratios – Person years

lived- Crude and Specific Rates- Standardization – Direct and Indirect Methods:
Components of Rates

Module Outcomes:

1. Explain different measures of population growth including doubling time (Understand).
2. Use the balancing equation and growth models to estimate future population size based on available demographic data (Apply).
3. Compare and analyze different population growth methods to determine their applicability and accuracy in various demographic scenarios (Analyze).

Module III: Mortality Measures Introduction- Crude and Specific Rates- standardized/Rates Infant Mortality – Infant Mortality Rate- Neo-natal, mortality rate- Post neonatal mortality- Peri natal mortality- Foetal Death- Child Mortality - Maternal Mortality - Morbidity: Prevalence and Incidence Rate

Module Outcomes:

1. Explain different mortality measures. (Understand).
2. Calculate and interpret various mortality indicators based on available demographic data (Apply).
3. Compare and analyze different standardized and specific mortality rates to determine their disparities across various groups, regions (Analyze).

Module IV: Fertility Measures: Introduction- Concepts- Types of Analysis- Period and Cohort Measures - Crude and Specific Rates- Standardised Rates–Total Fertility Rate- Gross Reproduction Rates- Net Reproduction Rate

Module Outcomes:

1. Explain the fundamental concepts and types of fertility analysis. (Understand).
2. Calculate and interpret various fertility indicators based on available demographic data (Apply).
3. Compare and analyze different standardized and specific fertility rates and reproduction measures for understanding population growth and replacement levels. (Analyze).

Module V: Life Table- Concepts- Assumptions- Construction of Life tables-Complete and Abridged Life tables -Various types – Single Decrement Associated Life tables, Double Decrement Life Table- Healthy Life Expectancy- Disability Free Life Expectancy- Uses of Life Tables.

Module Outcomes:

1. Explain the fundamental concepts and types of Life table. (Understand).

2. Construct and interpret life tables using given mortality data (Apply).
3. Analyze the uses of various types of life tables in demographic and public health (Analyze).

Module VI: Methods of Population estimation and Projection – Mathematical and Cohort Component methods, Assumptions, on fertility, Mortality and Migration

Module Outcomes:

1. Describe the mathematical and cohort component methods of population estimation and projection (Understand).
2. Apply mathematical and cohort component techniques to estimate and project population size for different demographic groups (Apply).
3. Evaluate the accuracy and reliability of population projections (Evaluate).

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested Class Room Activities:

- Assignments
- Seminar Presentation on selected topics
- Debates
- Quiz
- Demonstration of simple experiments
- Field work and survey

LEARNING RESOURCES

- Barclay, G W: Techniques of Population Analysis, John Wiley and Sons, New York
- Hinde, Andrew: Demographic Methods, London, 1998
- Jaffe, A J: Hand Book of Statistical Methods for Demographers, US Govt. Printing Office, Washington.
- Majumdar, P.K: Fundamentals of Demography, Rawat Publications, Jaipur, 2010
- MISRA, B D: An Introduction to the Study of Population, New Delhi: South Asian Publishers, Pvt Ltd.,
- Pathak, K.B. & F.RAM: Techniques of Demographic Analysis, Himalaya Publishing house, Mumbai, 1998
- Pollard, J .H: Demographic Techniques, Pengamon Press, Australia.
- Preston, Samuel H, Patrick Heuveline and Michel Guillot: Demography – Measuring and Modeling Population Processes
- Ramakumar, R: Technical Demography, Wiley Eastern Ltd., New Delhi
- Shryock, Henry S, Jacob S Seigel and Associates: The Methods and Materials of Demography, Vol. 1 & 2, US Bureau of the Census, Washington DC
- Speegelman, M: Introduction to Demography, Harvard University Press, Cambridge
- Srinivasan, K: Basic Demographic Techniques and Applications, Sage Publications, New Delhi

Semester	Course Code	Course Name	Credits
3	DAS-DE-536	Risk Management	2

Course Outcomes (COs)

CO1 Understand the nature of risk, its classifications, and the role of risk management in organizational strategy.

CO2 Design an effective risk management programme with clear objectives and responsibilities.

CO3 Apply risk assessment tools for identifying, evaluating, and prioritizing various risk exposures.

CO4 Evaluate and implement appropriate risk control and risk financing techniques.

CO5 Analyze advanced risk transfer mechanisms including reinsurance, capital market solutions, and disaster planning.

CO6 Utilize risk management checklists and planning tools to ensure operational continuity and safety.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	1, 3	R, U, An	F, C
CO2	1, 4	U, Ap, C	C, P
CO3	1, 4, 5	U, Ap, An, C	C, P
CO4	1, 5	E, Ap	P
CO5	1, 5	U, An, Ap	C, P
CO6	1, 3, 5	Ap, C, E	P, M

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I:

Risk and theory of Probability- The concept of risk, Risk and uncertainty, Risk possibilities, Risk classification, Risk attitude, Risk costs, Risk management- Scope and objectives- Contributions and benefits, Strategic management Vs. Risk management.

MO1.1: Define risk, uncertainty, and various risk classifications. (*R, U*)

MO1.2: Explain the objectives and scope of risk management. (*U*)

MO1.3: Differentiate between strategic management and risk management. (*An*)

MODULE II:

Building- up an effective Risk management programme- Deciding the programme objectives, defining the role, responsibilities and functions of risk manager, organizing and putting the programme in place, Formulating a risk management policy.

MO2.1: Formulate objectives of a risk management programme. (*Ap*)

MO2.2: Define the role and responsibilities of a risk manager. (*U*)

MO2.3: Develop a framework for implementing a risk management policy. (*Ap, C*)

MODULE III:

Important steps in risk management decision making process- Identifying and analysing loss expenditures, Risk identification, assessment of risk exposures, prioritizing of risks, Risk mapping.

MO3.1: Identify and analyze different types of loss exposures. (*U, Ap*)

MO3.2: Apply tools for risk assessment and prioritization. (*Ap, An*)

MO3.3: Construct and interpret risk maps. (*Ap, C*)

Module IV:

The feasibility of alternate techniques, risk control, risk financing and insurance, selecting the best technique, implementing the chosen technique, Monitoring and improving the risk management programme

MO4.1: Evaluate risk control and financing techniques. (*E*)

MO4.2: Choose the most feasible risk management technique for a given scenario. (*E*)

MO4.3: Monitor and revise a risk management programme. (*Ap, E*)

MODULE V:

Alternate risk transfer mechanisms, Finite risk reinsurance and risk transfer to the capital markets, Enterprise Risk management, Business continuity, management and disaster/ Emergency / Catastrophe- recovery planning, Loss exposures from major classes.

MO5.1: Describe finite risk reinsurance and capital market instruments. (*U*)

MO5.2: Analyze the concept of Enterprise Risk Management (ERM). (*An*)

MO5.3: Develop disaster recovery and business continuity plans. (*Ap, C*)

Module VI:

Risk management checklists- Security and safety checklist, Property protection checklist, Liability checklist, Safety analysis chart, Emergency management plan.

MO6.1: Apply risk management checklists for various domains. (*Ap*)

MO6.2: Design an emergency management plan using safety analysis tools. (*C*)

MO6.3: Evaluate the effectiveness of security and liability safeguards. (*E*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

Reference:

- **Principles of Risk management and Insurance- Dheeraj Razdan**
- **Principles of Risk management and Insurance- Dr. B. C. Shukla**
- **Risk Management and Insurance – D. D. Sharma**
- **Introduction to Risk management and Insurance- Dorfman**
- **Risk Management- IC-86- Insurance Institute of India**

Semester	Course Code	Course Name	Credits
4	DAS-CC-541	Actuarial Practice	4

Course Outcomes (CO):

CO1 Explain the structure and application of the actuarial control cycle and its role in risk management.

CO2 Identify various stakeholders and client contexts in which actuaries provide advice and understand their interests and decision-making processes.

CO3 Analyze the impact of external environmental factors such as legislation, taxation, social trends, and global practices on actuarial work.

CO4 Evaluate the role and objectives of regulation, regulatory costs, and principles of fair treatment to customers.

CO5 Identify financial products and insurance schemes and assess how these meet the needs of various stakeholders including customers and policymakers.

CO6 Understand the features of benefit systems and assess the roles of state, employer, and individuals in providing and managing retirement and other long-term benefits.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1	PSO 1, PSO 5, PSO 7	U, Ap, An	C, P
CO2	PSO 1, PSO 3, PSO 4	U, Ap	C, P
CO3	PSO 1, PSO 2, PSO 6	U, An, E	C, P
CO4	PSO 1, PSO 5, PSO 6	U, An, E	C, P
CO5	PSO 1, PSO 2, PSO 7	U, Ap, An	C, P
CO6	PSO 1, PSO 5, PSO 7	U, Ap, E	C, P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE 1

Introduction, The framework of the actuarial control cycle, How does the ACC relate to Subject, The actuarial control cycle, What makes the actuarial control cycle a 'control

cycle'?, What makes the actuarial control cycle 'actuarial'?, The steps in the actuarial control cycle, Professionalism. Practical applications of the actuarial control cycle, Risk-Investment risk, Credit risk, Risk measuring, Managing risk.

MO1.1: Explain the structure and steps of the actuarial control cycle. (*U*)

MO1.2: Identify what makes the control cycle 'actuarial' and a 'control system'. (*U, Ap*)

MO1.3: Apply the control cycle to practical actuarial scenarios. (*Ap, An*)

MO1.4: Describe types of risk including investment and credit risk, and strategies for risk measurement and management. (*U, Ap*)

MODULE II:

Actuarial advice: The clients actuaries advise- Possible clients, Other stakeholders affected by actuarial advice given to clients- Examples, The interests and functions of the clients- Policyholders and prospective policyholders, Members of benefit schemes and their dependent, Information about the client, The end customer, Advice and decisions, Making decisions.

MO2.1: Identify key clients of actuaries and understand the impact of actuarial advice on various stakeholders. (*U*)

MO2.2: Describe client interests such as those of policyholders and scheme members. (*U, Ap*)

MO2.3: Analyze the nature of actuarial advice and its role in decision-making processes. (*An, E*)

MODULE III:

External environment- Legislation and regulations, State benefits, Tax- benefits, accounting standards, contributions and accumulation in return. Risk management requirements, capital adequacy and solvency, climate change, lifestyle considerations, international practice, technological changes.

MO3.1: Analyze the effect of legislation, taxation, and accounting standards on actuarial work. (*An*)

MO3.2: Evaluate external influences including state benefits, climate change, technology, and global practices. (*An, E*)

MO3.3: Understand capital adequacy, solvency, and risk management requirements in the actuarial context. (*U, Ap*)

MODULE IV:

Regulation- The aims of regulation, The cost of regulation- Direct costs, Indirect costs. The need for regulation- confidence, Asymmetric information, The functions of a regulator, the implications of a requirement to treat the customer fairly.

MO4.1: Explain the aims and types of regulatory frameworks. (*U*)

MO4.2: Distinguish between direct and indirect regulatory costs. (*U, An*)

MO4.3: Evaluate the need for regulation, including confidence-building and handling asymmetric information. (*E*)

MO4.4: Interpret the implications of the regulatory requirement to treat customers fairly. (*U, E*)

MODULE V:

Introduction to financial products and customer needs- Types of provision, Social security benefits, Financial products and contracts- insurance and reinsurance. Investment schemes, Analyzing stakeholders needs.

MO5.1: Classify types of financial products including insurance, reinsurance, and investment schemes. (*U*)

MO5.2: Analyze social security provisions and their role in financial planning. (*An*)

MO5.3: Assess customer and stakeholder needs and how products address those needs. (*An, E*)

MODULE VI:

Benefits overview and providers of benefits- Key features of pension contracts, Benefits providers, Introduction to the roles of the State, the roles of the State in relation to retirement benefits, Introduction to the roles of the employer, the role of individuals.

MO6.1: Identify key features and types of pension and benefit contracts. (*U, Ap*)

MO6.2: Recognize benefit providers including insurers, employers, and the State. (*U*)

MO6.3: Assess the respective roles of the State, employer, and individual in managing retirement and benefit obligations. (*An, E*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

Semester	Course Code	Course Name	Credits
4	DAS-CC-542	Practice of insurance in the Indian context	4

Course Outcomes (CO):

- CO1** Understand the regulatory framework and the role of actuaries and underwriters in insurance operations.
- CO2** Explain the process of proposal, acceptance, policy documentation, pricing, and capacity in insurance.
- CO3** Analyze investment and taxation regulations applicable to insurance businesses in India.
- CO4** Evaluate fund management and profit-sharing regulations between policyholders and shareholders.
- CO5** Distinguish between life and non-life insurance products and assess documentation and health insurance variants.
- CO6** Interpret solvency norms, grievance redressal mechanisms, and the operational role of third parties and ombudsman in claims settlement.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1	PSO 1, PSO 4	R, U	F, C
CO2	PSO 1, PSO 3, PSO 5	U, Ap, An	C, P
CO3	PSO 1, PSO 6	U, An	C, P
CO4	PSO 1, PSO 2, PSO 6	U, Ap	C, P
CO5	PSO 1, PSO 5	U, Ap, An	C, P
CO6	PSO 1, PSO 5, PSO 7	U, Ap, E	C, P

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Role of Actuaries in Insurance practice – Appointed Actuary System- - Formation of insurance company and its restrictions, IRDAI, Principal functions of underwriters.

MO1.1: Describe the role of actuaries in insurance operations, including the Appointed Actuary system. (*R, U*)

MO1.2: Understand the regulatory provisions regarding the formation of insurance companies. (*U*)

MO1.3: Explain the functions of IRDAI and the role of underwriters. (*U*)

MODULE II: Proposal Form, Acceptance of Insurance and Policy Documents- Pricing of Insurance Contracts – principles- Capacity to insurance and Reinsurance requirements in the Indian context.

MO2.1: Outline the process of proposal form submission, acceptance, and issuance of policy documents. (*U*)

MO2.2: Understand the principles of pricing insurance contracts. (*U, Ap*)

MO2.3: Analyze capacity considerations and reinsurance requirements in the Indian context. (*An*)

MODULE III: Taxation of Insurance business- Investment Regulations- System of scientifically valid provisions for unexpired contracts – Reserves, Policy documents and forms.

MO3.1: Explain the taxation structure applicable to insurance businesses. (*U*)

MO3.2: Analyze investment regulations and the importance of reserving for unexpired risks. (*An*)

MO3.3: Describe policy forms and their regulatory significance. (*U*)

MODULE IV: Maintenance of separate funds for policyholders and shareholders- Profit sharing Regulations between policyholders and shareholders- Principle of Average Clause and Indisputability clause- Subrogation.

MO4.1: Understand the need for separate funds for policyholders and shareholders. (*U*)

MO4.2: Explain the regulatory guidelines for profit sharing between stakeholders. (*U, Ap*)

MO4.3: Interpret key insurance clauses like average clause, subrogation, and indisputability clause. (*U, Ap*)

MODULE V: General differences between Life and Non-life insurances- Medical Care Insurance and related matters, Policy vs proposal, Policy endorsement, renewal documents, variants of health insurance products

MO5.1: Distinguish between life and non-life insurance practices. (*U, An*)

MO5.2: Understand the regulatory aspects of health insurance and medical care products. (*U*)

MO5.3: Describe policy documents, endorsements, renewals, and product variants. (*U, Ap*)

MODULE VI: Solvency of insurers and requirements of Solvency margins- Grievance Redressal system for policyholders- Insurance Ombudsman- Requirements of speedy settlement of Claims and Role of third parties – surveyors and average- Miscellaneous matters - accounting etc.

MO6.1: Explain solvency margins and their importance in insurance stability. (*U*)

MO6.2: Evaluate grievance redressal mechanisms like Ombudsman and claims settlement norms. (*E*)

MO6.3: Describe the roles of surveyors, third parties, and accounting in insurance claim processes. (*U, Ap*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

References:

- Michael G. McMillan, Jerald E. Pinto, Wendy Pirie and Gerhard Van de Venter (Feb 8, 2011) “Investments: Principles of Portfolio and Equity Analysis”
- Goff T.G, “The theory and practice of investment”
- Timothy E. Johnson, “Investment Principles”, Prentice Hall College Div; 2 Sub edition (December 1982)

Semester	Course Code	Course Name	Credits
4	DAS-DE-543	Data Analysis using SPSS	2

Course Outcomes (CO):

CO1 Understand the SPSS interface and create data files using proper coding structures.

CO2 Edit, clean, and transform data; generate basic descriptive statistics and frequency tables.

CO3 Visualize data using a range of statistical graphs and identify suitable statistical tests for analysis.

CO4 Describe measurement scales, assess reliability and validity, and formulate hypotheses.

CO5 Apply appropriate parametric and non-parametric tests for data analysis using SPSS.

CO6 Perform regression analysis, including binary logistic and linear regression models in SPSS.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1	PSO 1, PSO 6	R, U, Ap	F, C, P
CO2	PSO 1, PSO 3, PSO 6	U, Ap, An	C, P
CO3	PSO 1, PSO 5	Ap, An, E	P, C
CO4	PSO 1, PSO 6, PSO 7	U, Ap, E	C, P
CO5	PSO 1, PSO 2, PSO 6	Ap, An, E	P, C
CO6	PSO 1, PSO 6, PSO 7	Ap, E	P, C

COURSE CONTENT

MODULE I Getting started with SPSS - Familiarising SPSS windows, menus, and dialogue boxes- Open, save, and close SPSS data and output files - Prepare a data entry codebook and Create a SPSS data file

MO1.1: Navigate SPSS interface, menus, and dialogue boxes. (*R, U*)

MO1.2: Open, save, and close SPSS data and output files. (*U, Ap*)

MO1.3: Prepare codebooks and create SPSS datasets for analysis. (*Ap, Cr*)

MODULE II Editing and Manipulating Data-Enter data into an SPSS data file - Check a data file for errors - Correct errors in the data file - Obtain descriptive statistics – frequency-crosstabs-Reducing and Transforming data-Compute procedure.

MO2.1: Enter and validate data in SPSS data files. (*Ap*)

MO2.2: Perform descriptive statistics and crosstabulations. (*Ap, An*)

MO2.3: Use data transformation techniques and compute procedures. (*Ap, An*)

MODULE III Exploring the data- Create a variety of graphs and charts (histograms, bar graphs, line graph, Pie chart, line graph, scatter plot, dot plot, box plot etc.) -Sorting the data file- Choose appropriate statistical techniques to address specific research questions

MO3.1: Generate appropriate graphs and charts using SPSS. (*Ap*)

MO3.2: Sort data and prepare files for specific analyses. (*Ap*)

MO3.3: Identify suitable statistical tests for different research objectives. (*An, E*)

MODULE IV Describing data- Describing Measurements-Nominal, Ordinal, Scaling, Ratio-creation of Index, Reliability and validity, Hypothesis testing, level of significance

MO4.1: Distinguish between nominal, ordinal, interval, and ratio scales. (*U, An*)

MO4.2: Create indexes and assess reliability and validity. (*Ap, E*)

MO4.3: Apply significance levels and hypothesis testing procedures. (*Ap, E*)

MODULE V Basic statistical analyses using common statistical methods- Parametric and Non Parametric tests: chi square, correlation, paired sample t-test, independent group's t-test, Mann Whitney U test, one-way, ANOVA

MO5.1: Conduct parametric tests (t-tests, ANOVA). (*Ap*)

MO5.2: Apply non-parametric tests (Chi-square, Mann Whitney U). (*Ap, E*)

MO5.3: Interpret outputs and assess statistical significance. (*An, E*)

MODULE VI Regression analysis-Binary logistic regression, and linear regression.

MO6.1: Perform linear regression analysis using SPSS. (*Ap, E*)

MO6.2: Conduct binary logistic regression and interpret results. (*Ap, E*)

MO6.3: Evaluate regression model outputs for prediction and inference. (*E*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz

Semester	Course Code	Course Name	Credits
Any	DAS-GC-501	Actuarial Science	2

Course Outcomes (CO):

CO Code

Description

- CO1 Apply fundamental concepts of interest theory in actuarial calculations.
- CO2 Describe the role of actuaries and interpret life table structures.
- CO3 Explain risk classification and basic insurance pricing principles.
- CO4 Interpret and apply the core principles of insurance contracts.
- CO5 Identify and differentiate among various insurance products and annuities.
- CO6 Understand introductory actuarial practices, including assumptions and trends.

Tagging course outcomes:

CO	PSO	CL	KC
CO1	PSO 1, PSO 5	Ap, An	C, P
CO2	PSO 1, PSO 2	U, Ap	F, C
CO3	PSO 1	R, U	C, F
CO4	PSO 1, PSO 3	U, Ap	C, P
CO5	PSO 1	R, U	F, C
CO6	PSO 1, PSO 4	R, U, Ap	C, P, M

(CL-Cognitive Level: R-remember, U-understand, Ap-Apply, An-analyse, E-evaluate, Cr-create, KC-Knowledge Category: F-factual, C-Conceptual, P-Procedural, M-Metacognitive)

COURSE CONTENT

MODULE I: Basics of Financial Mathematics - Concepts of simple and compound interest, Variable interest rates, Nominal vs. effective interest rates, Discounting and present value, Valuation of ordinary annuities

MO1.1: Compute values using simple and compound interest formulas. (Ap)

MO1.2: Compare nominal and effective interest rates. (An)

MO1.3: Apply present value and discounting techniques. (Ap)

MO1.4: Calculate the present value of ordinary annuities. (Ap)

MODULE II: Introduction to Actuarial Science and Life Tables - Role and responsibilities of an actuary, Life tables: structure and usage, Concept and importance of insurance, Historical and social need for insurance

MO2.1: Explain the professional roles and ethical responsibilities of actuaries. (U)

MO2.2: Interpret life table notations and survival functions. (U, Ap)

MO2.3: Discuss the historical and social need for insurance. (U)

MODULE III: Understanding Risk and Insurance - Definitions: risk, peril, and hazard, Types of risks: pure, speculative, financial, etc., Definition and purpose of insurance, Basic concepts of insurance product pricing

MO3.1: Define and differentiate between risk, peril, and hazard. (R, U)

MO3.2: Classify various types of risks. (U)

MO3.3: Explain the need and purpose of insurance. (U)

MO3.4: Describe the basic components involved in pricing insurance. (U)

MODULE IV: Principles of Insurance - Principle of indemnity, Principle of insurable interest, Utmost good faith, Subrogation and contribution

MO4.1: Explain the principle of indemnity and insurable interest. (U)

MO4.2: Interpret the principles of utmost good faith, subrogation, and contribution. (U, Ap)

MODULE V: Insurance Products and Applications - Life insurance and general insurance products, Health insurance variants, Introduction to annuities, Overview of life contingencies

MO5.1: Identify major life, general, and health insurance products. (R, U)

MO5.2: Describe the concept and features of annuities. (U)

MO5.3: Outline basic life contingency concepts. (U)

MODULE VI: Practical Concepts and Emerging Trends - Premium calculations and policy values (introductory level), Role of actuarial assumptions in pricing, Trends in insurance and actuarial practice, Basics of actuarial software and professional exams

MO6.1: Compute basic premiums and policy values using actuarial assumptions. (Ap)

MO6.2: Recognize the role of assumptions in product pricing. (U)

MO6.3: Summarize current trends in insurance and actuarial practice. (U)

MO6.4: Identify professional actuarial pathways and software tools. (R, U)

Suggested Class Room Activities:

- Assignments
- Seminar Presentation on selected topics

- Test Paper
- Debates
- Quiz

References:

- T.G.Goff, Theory and Practice of Investment
- Timothy E Johnson, Investment Principles

Assessment;

- ☐ 40% continuous assessment
- ☐ 60% End semester assessment (3 Hour written exam)

Semester	Course Code	Course Name	Credits
Any	DAS-GC-502	Data Analysis using SPSS	2

Course Outcomes (CO):

CO1 Understand the SPSS interface and create data files using proper coding structures.

CO2 Edit, clean, and transform data; generate basic descriptive statistics and frequency tables.

CO3 Visualize data using a range of statistical graphs and identify suitable statistical tests for analysis.

CO4 Describe measurement scales, assess reliability and validity, and formulate hypotheses.

CO5 Apply appropriate parametric and non-parametric tests for data analysis using SPSS.

CO6 Perform regression analysis, including binary logistic and linear regression models in SPSS.

Tagging course outcomes:

CO	Mapped PSOs	CL	KC
CO1	PSO 1, PSO 6	R, U, Ap	F, C, P
CO2	PSO 1, PSO 3, PSO 6	U, Ap, An	C, P
CO3	PSO 1, PSO 5	Ap, An, E	P, C
CO4	PSO 1, PSO 6, PSO 7	U, Ap, E	C, P
CO5	PSO 1, PSO 2, PSO 6	Ap, An, E	P, C
CO6	PSO 1, PSO 6, PSO 7	Ap, E	P, C

COURSE CONTENT

MODULE I Getting started with SPSS - Familiarising SPSS windows, menus, and dialogue boxes- Open, save, and close SPSS data and output files - Prepare a data entry codebook and Create a SPSS data file

MO1.1: Navigate SPSS interface, menus, and dialogue boxes. (*R, U*)

MO1.2: Open, save, and close SPSS data and output files. (*U, Ap*)

MO1.3: Prepare codebooks and create SPSS datasets for analysis. (*Ap, Cr*)

MODULE II Editing and Manipulating Data-Enter data into an SPSS data file - Check a data file for errors - Correct errors in the data file - Obtain descriptive statistics –frequency-crosstabs- Reducing and Transforming data-Compute procedure.

MO2.1: Enter and validate data in SPSS data files. (*Ap*)

MO2.2: Perform descriptive statistics and crosstabulations. (*Ap, An*)

MO2.3: Use data transformation techniques and compute procedures. (*Ap, An*)

MODULE III Exploring the data- Create a variety of graphs and charts (histograms, bar graphs, line graph, Pie chart, line graph, scatter plot, dot plot, box plot etc.) -Sorting the data file- Choose appropriate statistical techniques to address specific research questions

MO3.1: Generate appropriate graphs and charts using SPSS. (*Ap*)

MO3.2: Sort data and prepare files for specific analyses. (*Ap*)

MO3.3: Identify suitable statistical tests for different research objectives. (*An, E*)

MODULE IV Describing data- Describing Measurements-Nominal, Ordinal, Scaling, Ratio-creation of Index, Reliability and validity, Hypothesis testing, level of significance

MO4.1: Distinguish between nominal, ordinal, interval, and ratio scales. (*U, An*)

MO4.2: Create indexes and assess reliability and validity. (*Ap, E*)

MO4.3: Apply significance levels and hypothesis testing procedures. (*Ap, E*)

MODULE V Basic statistical analyses using common statistical methods- Parametric and Non Parametric tests: chi square, correlation, paired sample t-test, independent group's t-test, Mann Whitney U test, one-way, ANOVA

MO5.1: Conduct parametric tests (t-tests, ANOVA). (*Ap*)

MO5.2: Apply non-parametric tests (Chi-square, Mann Whitney U). (*Ap, E*)

MO5.3: Interpret outputs and assess statistical significance. (*An, E*)

MODULE VI Regression analysis-Binary logistic regression, and linear regression.

MO6.1: Perform linear regression analysis using SPSS. (*Ap, E*)

MO6.2: Conduct binary logistic regression and interpret results. (*Ap, E*)

MO6.3: Evaluate regression model outputs for prediction and inference. (*E*)

SUGGESTED CLASSROOM ACTIVITIES:

- Assignments
- Seminar Presentation on selected topics
- Quiz