

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



Name of the Programme:

M.Sc. Actuarial Science

(Syllabus effective from 2021 Admission)



UNIVERSITY OF KERALA
Department of Demography

2021

PREAMBLE

The role of higher education is vital in securing the 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 the undergraduate 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 the Universities of the country. Accordingly, the University of Kerala has decided to implement the LOCF in all its departments under the auspices of 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 University of Kerala. The graduate attributes 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 Graduate Attributes 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 University of Kerala

- Continue life-long 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 late Dr R. Ramakumar, who was the then Professor and Head of Department of Statistics. In 1997 the department was renamed as Department of Demography.

The department offers MSc, MPhil and PhD programmes and also carries out research and extension activities in the field of population. Department also provides MSc programme in Actuarial science since 2013. 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 is 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 contents from Biostatistics, and the course was renamed as MSc Programme

in Demography and Biostatistics in 2018.

In addition to the usual academic activities, the Community Outreach Programme is carried out during the 3rd semester by the Post Graduate Students in Demography under the supervision of one of the faculty members. Under this, the students go to the field to collect information on demographic, socioeconomic, environmental aspects and regarding the facilities in the areas where studies are conducted. This programme intends to get the students familiarised with the current population situation in the rural areas and also for obtaining information about the felt needs of the population. The results of the programme are disseminated to the Panchayat Authorities, and the reports are handed over to enable them to take appropriate steps. The students undergo field training during the 4th semester and collect data from urban and rural areas for their M.Sc dissertations. The computer training for using different statistical packages is also imparted to the students.

The department actively researches in various fields of mortality, fertility, migration, urbanisation, reproductive and child health, ageing of the population and periodically publish reports. The research outcomes of the department and the PRC, apart from providing valuable information to the 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, University of Kerala by Directorate of Census Operations, Kerala, Ministry of Home Affairs, Government of India and the University of Kerala, Thiruvananthapuram. The objective of setting up the workstation is to permit qualified researchers optimum use of anonymised micro-data from Census 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 8000 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 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 | Credits |
|----------------------------|-------------|---|---------|
| I | DAS-CC-511 | Foundations of Financial Mathematics | 4 |
| | DAS-CC-512 | Actuarial Statistics - Probability theory and Distributions | 4 |
| | DAS-CC-513 | Principles of Insurance - Life, General and Health | 4 |
| | DAS-CC-514 | Techniques of Demographic Analysis | 4 |
| | DAS-DE-515 | Role of Actuaries in Insurance and Other Sectors | 2 |
| | DAS-DE-516 | Group Insurance and Employee Benefits | 2 |
| II | DAS-CC-521 | Applications of Financial mathematics | 4 |
| | DAS-CC-522 | Actuarial Statistics – Statistical Inference | 4 |
| | DAS-CC-523 | Data Analysis Using Excel and R | 2 |
| | DAS-CC-524 | Life Table Techniques and Population Projection | 2 |
| | DAS-DE-525 | Research Methodology | 2 |
| III | DAS-CC-531 | Life and Other Contingencies - Part I | 4 |
| | DAS-CC-532 | Advanced Multivariate Statistical Techniques | 4 |
| | DAS-CC-533 | Business Economics | 4 |
| | DAS-CC-534 | Reinsurance (Principles and Techniques) | 4 |
| | DAS-DE-535 | Basic Risk Modelling | 2 |
| IV | DAS-CC-541 | Life and Other Contingencies - Part II | 4 |
| | DAS-CC-542 | Practice of Insurance in the Indian Context | 4 |
| | DAS-CC-543 | Dissertation / Internship | 6 |
| | DAS-CC-544 | Data Analysis Using SPSS | 2 |
| | DAS-DE-545 | Agricultural Insurance | 2 |
| | DAS-DE-546 | Basic Principles of Investment | 2 |
| Any semester (I-IV) | DAS-GC-501 | Actuarial Science | 2 |

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|-------------------|--------------------------------|-------------------|
| SEMESTER I | Course Code: DAS-CC-511 | Credits: 4 |
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NAME OF THE COURSE: FOUNDATIONS OF FINANCIAL MATHEMATICS

Course Outcomes:

- CO1:** Explain Actuarial Science, Actuarial profession, and the examination conducted by the Institute of Actuaries, India.
- CO2:** Develop the ability to handle the Cashflow models, investments, and the time values of money.
- CO3:** Make up the awareness of how interest rates or discount rates may be expressed in terms of different time periods.
- CO4:** Examine the present value and accumulated value of a sum of money or a series of cash flows are calculated.
- CO5:** Measure the present value and accumulated values of continuously payable annuities, annuities payable more frequently than yearly.
- CO6:** Interpret the technique of professional way of approaching a financial problem involving different types of Annuities.

COURSE CONTENT:

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

MODULE II: Cash Flow models and investments- Introduction, Cash Flow Process, Examples of cash flow scenarios, a zero-coupon bond, a fixed interest security, an index linked security, Cash on deposit, an equity and Annuity certain.

MODULE III: Term structure of interest rates, per yield and yield to maturity spot rates, forward rates, duration and convexity of a cash flow sequence, evaluation of duration and convexity of a cash flow sequence, immunisation and convexity.

MODULE IV: Interest rates- Introduction, Nominal rate of interest, accumulation factors, force of interest, Formulae for accumulation and present values, the basic compound interest functions.

MODULE V: Discounted value and Accumulated value of cash flows, Valuing cash flows, Constant interest rate, Change in interest rates and interest income.

MODULE VI: Level Annuities and determination of their values- Introduction, Present values of Annuities payable in arrear and Annuities payable in advance and their accumulated values. Continuously payable annuities, their present values and accumulated values.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz

Learning Resources

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.

Assessment;

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

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|-------------------|--------------------------------|-------------------|
| SEMESTER I | Course Code: DAS-CC-512 | Credits: 4 |
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NAME OF THE COURSE: ACTUARIAL STATISTICS - PROBABILITY THEORY AND DISTRIBUTIONS

Course Outcomes:

- CO1:** Explain the concept of discrete and continuous random variables and their probability distributions including expectation and moments.
- CO2:** Construct the conceptualize the probabilities of events including frequentist and axiomatic approaches. Simultaneously, summarize the conditional probability including the concept of Bayes' Theorem, etc...
- CO3:** Identify the discrete and continuous distributions such as Binomial, Poisson, Geometric, normal, uniform, exponential, beta, gamma, Chi – square, Student's t, and F distributions.
- CO4:** Analyze the complete sample, sampling frame, sampling distribution, sampling methods, sampling and non-sampling probabilities, principal steps in sample surveys, limitations of sampling etc.,
- CO5:** Examine the central limit theorem and its uses in statistics.

COURSE CONTENT:

MODULE I: Descriptive Statistics –Variables- Types of variables- Frequency distribution and graphic representation- Measures of central tendency and dispersion-Moments- Skewness and Kurtosis

MODULE II: Probability Concepts and Random Variables -Basic concepts- Addition theorem-Multiplication theorem- Conditional probability- Bayes' Theorem- Probability Density Function - Distribution Function- Expectations- Moment Generating Function- Cumulant Generating Function and Characteristic Function

MODULE III: Discrete and Continuous Distributions – Uniform distribution- Binomial- Poisson Geometric- Exponential- Gamma- Beta and Normal distribution

MODULE IV: Joint Distributions - Concepts of independence- jointly distributed random variables and conditional distributions and application of generating functions to establish the distribution of linear combinations of independent random variables

MODULE V: Sampling and Sampling Distributions – Probability and Non-Probability Sampling, different sampling methods- Chi-Square- Student's t and F distributions

MODULE VI: Central limit theorem and its applications.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz

Learning Resources

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 Brocket 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

Assessment;

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

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| SEMESTER I | Course Code: DAS-CC-513 | Credits: 4 |
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NAME OF THE COURSE: PRINCIPLES OF INSURANCE - LIFE, GENERAL AND HEALTH

Course Outcomes:

- CO1:** Summarize various practices and principles in the insurance industry.
- CO2:** Classify and understand the various Insurance contracts.
- CO3:** Explain the principles adopted by the Insurance companies.
- CO4:** Analyze the major differences between Life and Non- Life Insurance contracts.

COURSE CONTENT

MODULE I: Brief Introduction on origin of insurance and its current applications

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

MODULE III: Life Insurance contracts and group life insurance Schemes.

MODULE IV: Health Insurance Contracts distinguished.

MODULE V: General Insurance Contracts distinguished including Miscellaneous Insurance Contracts

MODULE VI: Pension and Employee Benefit contracts

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz
- Demonstration of simple experiments

Learning Resources

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

Assessment;

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

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|-------------------|--------------------------------|-------------------|
| SEMESTER I | Course Code: DAS-CC-514 | Credits: 4 |
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TECHNIQUES OF DEMOGRAPHIC ANALYSIS

Course Outcomes:

- CO1:** Explain the importance and scope of Demography
- CO2:** Describe various sources of demographic data, quality of data and adjustments.
- CO3:** Explain the measures of summarisation of data on fertility and mortality.
- CO4:** Execute basic measures of fertility and reproduction in order to understand the population dynamics and human reproduction process for the effectiveness of population control programmes and their evaluation.
- CO5:** Use the mathematical procedures that measure population change.
- CO6:** Identify different measures of nuptiality and techniques for analyzing the marital data in understanding the process of marriage and its dissolution.
- CO7:** Explain about migration which forms as an important component of population growth.
- CO8:** Discuss about appropriate measures of urbanization.

COURSECONTENT:

Module I: Introduction: Concepts and Definitions of terms- fertility, mortality- Nuptiality- Migration- Structure of Population: Measures of Age and Sex Composition of the Population Age - pyramid, Quality of Age data- Errors in demographic data – Whipple's Index, Myer's Index- UN Joint Score Index- Sources of data – Census- Vital Statistics- Sample Surveys- Population registers- Quality of Data – Evaluation and Adjustment of Demographic Data Interpolation and Graduation

Module II: Population Growth: Measures of Population growth – Balancing Equation Arithmetic- Geometric- Exponential, Logistic- Doubling Time- Rates and

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

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

Module V: Measures of Nuptiality – Introduction- Crude Marriage rate- General Marriage rate- Age – Specific Marriage rate- Mean Age at Marriage- Singulate Mean Age at Marriage.

Module VI: Migration and Urbanization- Introduction and Concepts- Measures of Migration- Measures of Urbanization- Degree, Tempo and Concentration-Labour Force- Measures of Dependency – Age and Economic – Work Participation Rates

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, New York, John Wiley and Sons, Inc
- Asis Kumar Chattopadhyay & Anuj Kumar Saha - Demography Techniques & Analysis, Viva Books, New Delhi
- Guillaume J Wunsch & Marc G Termote – Introduction to Demographic Analysis Principles and Methods, Plenum Press, New York
- Srivastava S C & Sangya Srivastava – Studies in Demography, Anmol Publications, New Delhi.
- Hinde, Andrew - Demographic Methods, London

- Jaffe A J - Hand Book of Statistical Methods for Demographers, Washington, US Govt. Printing Office
- MISRA B D - An Introduction to the Study of Population, Madras Publishing
- Athak, K.B. & F.RAM -Techniques of Demographic Analysis, Himalaya publishing House, Mumbai.
- Pollard J H - Demographic Techniques Australia, Pengamon Press.
- Preston, Samuel H, Patrick Heuveline and Michel Guillot - Demography – Measuring and Modeling Population Processes.
- Ramakumar R - Technical Demography, New Delhi, Wiley Eastern Ltd.
- Shryock, Henry S, Jacob S Seigel and Associates - The Methods and Materials of Demography Vol. 1 & 2, Washington DC US Bureau of the Census.
- SPEEGELMAN M - Introduction to Demography Cambridge, Harvard University Press
- Srinivasan K - Basic Demographic Techniques and Applications, New Delhi Sage Publications.

Assessment;

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

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|-------------------|--------------------------------|-------------------|
| SEMESTER I | Course Code: DAS-DE-515 | Credits: 2 |
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NAME OF THE COURSE: ROLE OF ACTUARIES IN INSURANCE AND OTHER SECTORS

Course Outcomes:

- CO1:** Describe stochastic and liability models
- CO2:** Identify the emerging risks, execution and valuation of risk mitigation
- CO3:** Summarize premium pricing, calculation of surrender value, and calculation of solvency margin
- CO4:** Explain the Actuary's functions as a Chief Risk Officer
- CO5:** Contrast the duties and responsibilities of Actuaries in life, general and health insurance

COURSE CONTENT

MODULE I: Role of Actuaries in life and general insurance-establishing estimates for unpaid claim liabilities, premium pricing, surrender value calculations, underwriting, solvency calculations.

MODULE II: Role of Actuaries in health insurance-product development, pricing, reserving, solvency calculations, health utilisation and trend forecasts, health risk status analysis.

MODULE III: Role of Actuaries in private pensions and other employee benefits-funding requirements of occupational pension schemes and its solvency requirements, stochastic asset-liability model.

MODULE IV: Role of Actuaries in ERM(Enterprise Risk Management)- functions as a CRO(Chief Risk Officer), identify emerging risks, execution and valuation of risk mitigation.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz

Learning Resources

References:

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

Assessment;

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

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|-------------------|--------------------------------|-------------------|
| SEMESTER I | Course Code: DAS-DE-516 | Credits: 2 |
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NAME OF THE COURSE: GROUP INSURANCE AND EMPLOYEE BENEFITS

Course Outcomes:

- CO1:** Explain the various Group Insurance schemes.
- CO2:** Identify the employee benefits like Pension, Superannuation schemes and Group Gratuity schemes.
- CO3:** Outline the features of Group Insurance contracts vis-a-vis Life Insurance contracts.
- CO4:** Interpret the advantages and disadvantages of group schemes and the various employee benefit schemes.

COURSE CONTENT

MODULE I: Introduction to superannuation schemes- Pension-various types of pension and the options available. Two methods of calculation of pension-defined benefits scheme and defined contribution scheme.

MODULE II: Group life insurance-primary objective. Distinguish between group insurance from individual insurance. Various group schemes and the benefits available in such group schemes.

MODULE III: Gratuity benefits under payment of gratuity Act. Funding of gratuity liability. Group gratuity scheme and the method of operation.

MODULE IV: Salient features of group pension schemes. Group savings linked insurance.

MODULE V: Employees state insurance schemes(ESIS) and group Medclaim schemes.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments

- Seminar presentations
- Debates & Discussions
- Quiz

Learning Resources

References:

- Employees state insurance Acts & rules.
- Group insurance- a text book by I.I.I
- Payment of gratuity Act 1972
- S.G.Diwan, Group insurance

Assessment;

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

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| SEMESTER II | Course Code: DAS-CC-521 | Credits: 4 |
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NAME OF THE COURSE: APPLICATIONS OF FINANCIAL MATHEMATICS

Course Outcomes:

- CO1:** Calculate values of increasing annuities, decreasing annuities, and varying annuities calculation.
- CO2:** Interpret the yield on a transaction, values of payments depending on probability.
- CO3:** Identify the various methods of repayments of a loan, calculating the outstanding loan after a certain period etc...
- CO4:** Summarize project appraisal, internal rate of return, payable period, discounted payback period.
- CO5:** Examine the money-weighted return, time-weighted return, and linked internal rate of return and the different types of investments.
- CO6:** A broad description of various higher-order financial products and practical compound interest problems will be analyzed.

COURSE CONTENT:

MODULE I: Deferred and Increasing Annuities, Continuously payable Annuities, Annuities payable p - times a year, Varying Annuities and Decreasing Annuities.

MODULE II: Equations of value, Yield on a transaction, solving an unknown quantity and values of payments depending on probability.

MODULE III: Analysis of loan schedules and EMI- Introduction and an example, calculating the capital outstanding, Prospective and Retrospective method of calculating the loan outstanding. The loan schedule, flat rates and APRs.

MODULE IV: Project appraisal- Comparing two different projects, internal rate of return, net present value, accumulated profit, payback period and discounted payback period.

MODULE V: Different rates of return- Money weighted return, Time weighted return and linked internal rate of return.

MODULE VI: Investments- Fixed Interest Government bonds, Government bills, Debentures, Unsecured loan stocks, Ordinary shares, Preference shares and Convertibles.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz
- Demonstration of simple experiments

Learning Resources

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

Assessment;

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

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|--------------------|--------------------------------|-------------------|
| SEMESTER II | Course Code: DAS-CC-522 | Credits: 4 |
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NAME OF THE COURSE: ACTUARIAL STATISTICS - STATISTICAL INFERENCE

Course Outcomes:

- CO1:** Apply the basic analytical tools to a set of data.
- CO2:** Analyze important inferential aspects such as point estimation, a test of hypotheses, and associated concepts.
- CO3:** Examine the correlation, regression analysis, regression diagnostics, partial and multiple correlations.
- CO4:** Apply the one-way and two-way Analysis of Variance.
- CO5:** Analyse the time series data, its applications to various fields and components of time series

COURSE CONTENT

MODULE I: Methods of Estimation and properties of estimators and their applications – the methods of moments- the method of maximum likelihood- unbiasedness- consistency- efficiency- Mean square error- Asymptotic distribution of MLEs

MODULE II: Confidence Intervals – derivation of confidence intervals- confidence intervals for two-sample problems and interpretations on unknown parameter values

MODULE III: Testing of Hypothesis – Level of significance- Type one and type two errors- critical region- small sample and large sample tests- testing of hypothesis for mean- variance and proportions and differences- Chi square tests for goodness of fit and independence of attributes

MODULE IV: Correlation and Regression – Relation between variables- Curve fitting and Principle of least squares, two regression lines- Angle between regression

Lines- Pearson coefficient of correlation- Rank Correlation Coefficient- testing of Correlation Coefficient

MODULE V: Analysis of Variance and their applications - One way classification
Two way classification

MODULE VI: Analysis of Time Series – Introduction- Meaning- Uses- Components of Time Series- Measurements of trend. Free hand curve method – method of semi averages – method of moving averages – method of least squares.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz
- Demonstration of simple experiments

Learning Resources

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 Brocket 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

Assessment;

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

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|--------------------|--------------------------------|-------------------|
| SEMESTER II | Course Code: DAS-CC-523 | Credits: 2 |
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NAME OF THE COURSE: DATA ANALYSIS USING EXCEL AND R

Course Outcomes:

CO1: Use MS Excel and R Software to manage and analyse data

CO2: Interpret the results obtained in the data analysis to arrive at meaningful conclusions

COURSE CONTENT

MODULE I: Overview of excel: Introducing excel, Entering and editing worksheet data, performing basic worksheet operations, working with excel ranges and tables, performing basic worksheet functions, printing in excel, creating charts in excel.

MODULE II: Working with formulas and functions in excel: Introducing formulas and functions, using excel formulas- mathematical operations, date and time, conditional analysis, matching and Lookups and statistical analysis; analyzing data with pivot tables.

MODULE III: Introduction to the statistical software R, Basic operations in R, Mathematical functions used in R, Introduction to data structures - arrays, matrix and data frames.

MODULE IV: Graphics in R- An overview of R graphics, Basic graphic functions; visualization of data- frequency tables, bar chart, pie chart, contingency matrix, histograms, frequency polygon, box plot.

MODULE V: Statistical methods using R: Measures of Central tendency, Measures of dispersion; Statistical inference using R- Hypothesis testing – Parametric and non-parametric tests concerning means; Simple correlation and regression.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations

- Debates & Discussions
- Quiz
- Demonstration of simple experiments
- practical

Assessment;

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

| | | |
|--------------------|--------------------------------|-------------------|
| SEMESTER II | Course Code: DAS-CC-524 | Credits: 4 |
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NAME OF THE COURSE: LIFE TABLE TECHNIQUES AND POPULATION PROJECTION

Course Outcomes:

- CO1:** Describe the concept of life table.
- CO2:** Describe the construction of a life table
- CO3:** Demonstrate life table in various contexts
- CO4:** Execute the construction of multiple decrement life table
- CO5:** Illustrate Multi state life table
- CO6:** Discriminate all the demographic and mathematical procedures that are used in estimation and projection of population.
- CO7:** Execute population projections at national level.
- CO8:** Implement sub national level population projections, which is required for the development planning process.

COURSE CONTENT:

Module I: Life Table- Concepts- Assumptions- Construction of Life tables-Complete and Abridged

Module II: Various types – Single Decrement Associated Life tables, Double Decrement Life Table- Force of Mortality- Uses of Life Tables.

Module III: Multiple Decrement Life table –Causes of Death Life Table – Healthy Life Expectancy – Disability Free Life Expectancy

Module IV: Multi State Life table – Working Life Tables

Module V: Population Estimation and Projections – Methods of Population estimation and Projection – Mathematical and Cohort Component methods- Assumptions, on fertility- Mortality and Migration

Module VI Sub-National Population Projections – Ratio method, Apportionment

method, URGD method, Regression method

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, New York, John Wiley and Sons, Inc
- Hinde, Andrew Demographic Methods, London., New York
- Nathan Keyfitz & John A Beekman – Demography Through Problems, Springer
- Asis Kumar Chattopadhyay & Anuj Kumar Saha - Demography Techniques & Analysis, Viva Books, New Delhi
- Guillaume J Wunsch & Marc G Termote – Introduction to Demographic Analysis Principles and Methods, Plenum Press, New York
- Srivastava S C & Sangya Srivastava – Studies in Demography, Anmol Publications, New Delhi.
- Jaffe A J Hand Book of Statistical Methods for Demographers, Washington, US Govt. Printing Office
- MISRA B D An Introduction to the Study of Population, Madras, Publishing
- Athak, K.B. & F.RAM Techniques of Demographic Analysis, Mumbai, Himalaya publishing house.
- Pollard J H Demographic Techniques Australia, Pengamon Press.
- Preston, Samuel H, Patrick Heuveline and Michel Guillot: Demography – Measuring and Modeling Population Processes.
- Ramakumar R T e c h n i c a l Demography, New Delhi, Wiley Eastern Ltd.
- Shryock, Henry S, Jacob S Seigel and Associates, The Methods and Materials of Demography Vol. 1 & 2, Washington DC US Bureau of the Census.
- SPEEGELMAN M Introduction to Demography Cambridge, Harvard University Press
- Srinivasan K, Basic Demographic Techniques and Applications, New Delhi Sage Publications.

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| SEMESTER II | Course Code: DAS-DE-525 | Credits: 2 |
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NAME OF THE COURSE: RESEARCH METHODOLOGY

Course Outcomes:

- CO1:** Summarize the general introduction to social science research methods.
- CO2:** Develop understanding of the basic framework of research process.
- CO3:** Develop an understanding of various research designs and techniques.
- CO4:** Identify various sources of information for literature review and data collection.
- CO5:** Formulate good research questions and design appropriate research.
- CO6:** Interpret and Collect their own data using a variety of methods.
- CO7:** Analyse both qualitative and quantitative data using computer-based skills.
- CO8:** Critically evaluate their own research and that of other social scientists.

COURSE CONTENT

MODULE I: Social Research- Scope of Social Research- Development of Research Methodology- Nature and Importance of research, aims of social research- research process- pure research vs- applied research- qualitative research vs quantitative research- exploratory research- descriptive research and experimental research- Stages of research process

MODULE II: Research Design- Meaning of Research Design- Functions and goals of Research Design- characteristics- phases- design for different types of research- pilot study

MODULE III: Sampling design and sampling procedures- Probability Vs- Non-probability sampling techniques- determination of sample size- Questionnaire Construction and Interviewing Case Studies-Content Analysis-Data processing and Analyses- Coding- Tabulation.

MODULE IV: Methods of Data Collection - Discussion on primary data and secondary data- tools and techniques of collecting data- Observational- Survey Research- Qualitative- Secondary data analysis.

MODULE V: Testing of Hypothesis- Small sample test- Student's- t distribution- chi- square test- F-test - test for Mean- Test concerning Proportions- Correlation and Regression

MODULE VI: Analysis Methods- Editing and coding, transform raw data into information- basic data analysis- descriptive statistics- Interpretation and Report Writing- Bibliography- Citation

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz
- Field work

Learning Resources

- Arlene Finil & Jacqueline kosecoff, How to conduct surveys, - A step by step guide, New Delhi, Sage Publications
- Desai P B, A survey of research in Demography, Mumbai, Popular Prakashan 18 18
- Devendra Thakur, Research Methodology in Social Sciences, New Delhi, Deep and Deep Publication
- Goode, William J & Paul K Hatt, Methods in Social Research Mc GRAW HILL, International Book Company
- Julian L Simon, Basic Research Methods in Social Science –The Art of Empirical Investigation, New York, Random House
- Kenneth D Bailey, Methods of Social Research, New York, Macmillon Publishing Company. Inc.
- Kothari C R, Research Methodology Methods and Techniques, New Delhi, Wishwa Prakashan
- Nachmias David & Chava Nachmias, Research Methods in the Social Sciences, New York, St.Martin's Press

- Therese L Baker Doing Social Research, New York, Mc. GRAW HILL
- Wilkinson T S & P L BHANDRKAR Methodology and Techniques of Social research Mumbai, Himalaya Publishing House

Assessment;

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

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| SEMESTER III | Course Code: DAS-CC-531 | Credits: 4 |
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NAME OF THE COURSE: LIFE AND OTHER CONTINGENCIES PART - I

Course Outcomes:

- CO1:** Analyze different types of assurances and how the probability of death and survival are calculated using life tables.
- CO2:** Examine the different types of Life annuities and increasing life Annuities.
- CO3:** Summarize the handling of different life tables, select tables, ultimate tables, and also notation for different probabilities.
- CO4:** Examine the select period in a select Mortality table.
- CO5:** Categorize the single premium, Annual premium, and arrives for different types of Assurances.
- CO6:** Shows how the annual premium is arrived at for a with profit policy.

COURSE CONTENT

MODULE I: Life assurance contracts such as Term Assurance, Whole Life Assurance, Pure Endowment Assurance and Endowment Assurance.

MODULE II: Life Annuity Contracts such as Annuity for Life, Annuity payable for a certain period or till death if death happens earlier and increase in life Annuity.

MODULE III: Different Life Tables, notations for different probabilities used, select table and Ultimate table.

MODULE IV: Evaluation of single premium for different types of Assurances and Annuities.

MODULE V: Evaluation of Annual Premiums for different types of Assurances.

MODULE VI: With profit policies and Calculation of Premium.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz

Learning Resources

References:

- Alistair Neil "Life Contingencies", Butterworth-Heinemann Ltd., Illustrated Edition (1977)
- Smith B.H "Contingencies of Value", Harvard 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.

Assessment;

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

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| SEMESTER III | Course Code: DAS-CC-532 | Credits: 4 |
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NAME OF THE COURSE: ADVANCED MULTIVARIATE STATISTICAL TECHNIQUES

Course Outcomes:

- CO1:** Explain the need for multivariate analysis.
- CO2:** Classify the variables as Qualitative and Quantitative.
- CO3:** Define the terms, Dummy variables, Interaction, Autocorrelation, and Multicollinearity.
- CO4:** Differentiate factor analysis technique from other multivariate techniques.
- CO5:** Describe how to determine the number of factors to extract.
- CO6:** Apply Logistic Regression, Survival models and Proportional Hazard Model to suitable data

COURSE CONTENT

MODULE I: The need for multivariate analysis- data requirements- statistical modelling- need causal relationships- Dummy variables- multicollinearity interaction – with correlation- without correlation- autocorrelation.

MODULE II: Multiple Linear Regression- objectives – Research design – Assumptions – estimating regression models – assessing overall model fit and interpret regression variate.

MODULE III: Multiple Classification Analysis (MCA)- Basic MCA-unadjusted and adjusted values, MCA with interactions; Path analysis.

Module: IV Factor analysis- concept – Factor loading – Factor Scores - Eigen Values – Rotation of factors – naming of factors.

MODULE V: Logistic Regression and Discriminant Analysis: Regression with binary dependent variable, estimating logistic regression model, assessing the goodness-of-fit of the estimation model, testing for significance of the coefficients and interpreting the coefficients. Discriminant Analysis- Objectives, research design,

assumptions, estimation of models and assessing the overall fit and interpretation of results.

MODULE VI: Survival Analysis: motivating the need; concepts and definitions; concept of censoring and type of censoring; Kaplan-Meier estimates; Cox-proportional hazard models.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz

Learning Resources

References:

- Alexander M Mood, Frankilin a Graynil, Guane C Boes, Introduction to the Theory of Statistics Third Edition: Mc Graw Hill Book Company, Singapore
- Donald F Morrison, Multivariate Statistical Methods Second Edition: Mc Graw Hill Book Company, Singapore
- Donald F Morrison, Multivariate Statistical Methods, Second Edition: Mc Graw Hill Book Company, Singapore
- George H Dunteman, Introduction to Linear Models: Sage, New Delhi
- James Stevens Lawrence, Applied Multivariate Statistics for the Social Sciences: Erlbaum Associates, Publishers Hillsdale, New Jersey
- Jane Miller' Statistics for Advanced Level – Second Edition: Press Syndicate of the University of Cambridge, New York
- Krishnan Namboodiri & Suchindran C M, Life Table Techniques and their Applications Florida, Academic Press
- Medhi J, Statistical Methods – An Introductory Text: New Age International (P) Ltd. Publishers, New Delhi
- Ramakumar R. Technical Demography, New Delhi, Wiley Eastern Ltd.

- Richard F Gunst, Regression Analysis and its application – A Data Oriented Approach
- Robert L Mason Library of Congress Cataloging in Publication Data 270 Madison Avenue, New York
- Wassermann and Neter, Regression Analysis.

ADDITIONAL RESOURCES

- <https://www.decisionanalyst.com/whitepapers/multivariate/>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3071962/>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3936971/>
- <http://www.unesco.org/webworld/portal/idams/html/english/E1mca.htm>
- <http://www.statisticssolutions.com/factor-analysis-sem-factor-analysis/>

Assessment;

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

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| SEMESTER III | Course Code: DAS-CC-533 | Credits: 4 |
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NAME OF THE COURSE: BUSINESS ECONOMICS

Course Outcomes:

- CO1:** Summarize the theoretical and practical understanding of the economic concepts and theories in the process honing their critical thinking, analytical and problem-solving skills.
- CO2:** Analyse the economic environment in which organizations function to be able to make economic decisions
- CO3:** Define the macroeconomic and microeconomic concepts, principles and theory to enable students to analyse and interpret the economic environment in making informed judgments.
- CO4:** Explain the applications of theory of production and cost structure
- CO5:** Examine the various forms of market structure and how they work to allocate resources and the optimal decision-making for efficient outcomes.
- CO6:** Examine the efficient allocation of inputs through General equilibrium analysis.
- CO7:** Analyzing a firm profit maximizing strategy under the various oligopoly models.
- CO8:** Identify the causes of market failure to provide efficient outcome.
- CO9:** Analyze aggregate demand and aggregate supply schedules and differentiate between effects of policy in the short-run and medium-run.

COURSE CONTENT

MODULE I: Economic concepts and systems- Different economic systems- Main strands of economic thinking- Demand- Supply- Price and output determination- The concepts of Micro economics and Macro economics. The government intervention in the market. The role of price mechanism in a free market.

MODULE II: Effect of supply on business and economy. Types of supply-side policies that can be pursued and their effectiveness. Factors that affect elasticity- Effect of elasticity on the workings of markets in the short and long run. Concept of

utility. The way insurance companies help to reduce or remove risk, moral hazard and adverse selection.

MODULE III: Revenue and production function and the relationship between inputs and outputs in the short and long run. Explain how the meaning and measurement of costs vary with output in the short and long run. Explain how revenue and profit are influenced by average and marginal revenue.

MODULE IV: Determination of exchange rates and the effects of changes in exchange rate on business. Relationship between the balance of payments and exchange rates. Advantages and disadvantages of fixed and floating exchange rates. Determination of price level in economy by the interaction between aggregate supply and aggregate demand in a simple AS-AD model.

MODULE V: Causes and costs of inflation and how inflation relates to the level of business activity. Determination of interest rates. Relationship between money and interest rates. Emergence of monopolies-profit maximizing price and output. Profit maximization under imperfect competitions. Main features of oligopoly and explain how firms behave in an oligopoly.

MODULE VI: Define product differentiation. Explain how product differentiation or diversification helps to achieve internal expansion. Relationship between growth and profitability. Methods of price determination practice and factors that affect the ability of a firm to determine its prices. Pricing strategy for multiple products and explain how pricing varies with the stage in the life of a product.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz

Learning Resources

References:

- John Sloman, Kevin Hinde and Dean Garrat, " Economics for Business", Sixth edition, Peason,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.

Assessment;

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

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| SEMESTER III | Course Code: DAS-CC-534 | Credits: 4 |
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NAME OF THE COURSE: REINSURANCE (PRINCIPLES AND TECHNIQUES)

Course Outcomes:

- CO1:** Examine the various reinsurance treaties and working of the reinsurance market.
- CO2:** Analyze the working of the Reinsurance market in India.
- CO3:** Explain the capabilities of assessing various reinsurance treaties and working of the reinsurance market.
- CO4:** Examine the reinsurance treaties between the insurer and reinsurer established through practical examples.

COURSE CONTENT:

MODULE I: Reinsurance- introduction-functions and advantages. Forms of reinsurance. Factors affecting reinsurance. "Follow the fortune clause" in reinsurance.

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

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.

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

MODULE V: Reinsurance in India. GICRe, stabilization of claims ratio, protection of solvency margin, stabilisation of profitability.

MODULE VI: Reinsurance loss reserving programme objectives, primary objectives.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz

Learning Resources

References:

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

Assessment;

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

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| SEMESTER III | Course Code: DAS-DE-535 | Credits: 2 |
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NAME OF THE COURSE: BASIC RISK MODELLING

Course Outcomes:

CO1: Explain the basic theory of risk modelling.

CO2: Identify the various functions of random variables and various counting processes.

CO3: Identify the various distribution functions like MGF, CGF and Joint density functions.

CO4: Apply the basic analytical tools to a set of data.

COURSE CONTENTS

MODULE I: Random variables and definition of Cramor-Lundberg risk model, Hazard rate function, moments, Transforms such as probability generating functions, moment generating functions, characteristic functions, Laplace Transform.

MODULE II: Counting random variables, continuous random variables, distributions-Negative binomial, Weibull, Pareto, Log normal, Inverse Gaussian, Erlang.

MODULE III: Functions of random variables, joint density and distribution function, conditional distributions, sum of random variables.

MODULE IV: Counting processes-Poisson process, renewal process, Renewal Function, recurrence times of a renewal process, Delayed renewal process, mixed Poisson process, compound Poisson process, P_olya-Aeppli process.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions

- Quiz
- Demonstration of simple experiments

Learning Resources

References:

- Mark.S.Dorfman, "Introduction to risk management and insurance", New Jersey, Prentice Hall, 2002
- Patrick Brocket Arnold Levine Saunders, "Statistics and Probability and their applications", College Publishing, USA

Assessment;

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

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| SEMESTER IV | Course Code: DAS-CC-541 | Credits: 4 |
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NAME OF THE COURSE: LIFE AND OTHER CONTINGENCIES PART - II

Course Outcomes:

- CO1:** Explain the calculation of various assurance benefits and annuities to single life and joint life.
- CO2:** Analyze the retrospective and prospective reserves. And also examine the mortality profits, expected death strain, and actual death strain.
- CO3:** Define the Joint life assurances and joint life annuities.
- CO4:** How to operate the contingent probabilities involving two lives and contingent assurances involving two lives.
- CO5:** Define the meaning of μ_{xy} and values of assurances payable immediately on death.
- CO6:** Explain the six types of Reversionary annuities.

COURSE CONTENT

MODULE I: Gross Premiums and reserves for fixed and variable benefit contracts.

MODULE II: Simple annuities and assurances involving 2 lives. Contingent probabilities involving 2 lives.

MODULE III: Multiple decrement tables – Service tables, types of decrements, updating a service table, relation between single and multiple decrement table, independent rates, dependent rates, assumptions.

MODULE IV: Contingent Assurance

MODULE V: Force of Mortality involving 2 lives, values of benefits using integrals when payment of benefit is immediately on death or payment is continuous.

MODULE VI: Reversionary Annuities (Different types)

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz

Learning Resources

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

Assessment;

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

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| SEMESTER IV | Course Code: DAS-CC-542 | Credits: 4 |
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NAME OF THE COURSE: PRACTICE OF INSURANCE IN THE INDIAN CONTEXT

Course Outcomes:

- CO1:** Explain the different practices, laws and rules so as to enable to take up an Actuarial career.
- CO2:** Examine the different methods and practices adopted by both Life and non-life insurance companies.
- CO3:** Examine the various grievance redressal system that is available for the policyholder.
- CO4:** How the Insurance Ombudsman as a mediator resolves the disputes that might arise in the Insurance industry.
- CO5:** Develop knowledge in the ways and methods of real insurance practice.

COURSE CONTENT

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

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

MODULE III: Taxation of Insurance business- Investment Regulations- System of scientifically valid provisions for unexpired contracts – Reserves

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

MODULE V: General differences between Life and Non-life insurances- Medical Care Insurance and related matters

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

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz

Learning Resources

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)

Assessment;

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

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| SEMESTER IV | Course Code: DAS-CC-543 | Credits: 6 |
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NAME OF THE COURSE: DISSERTATION / INTERNSHIP

Course Outcomes:

CO1: Apply the skills acquired to carry out scientific research on any area in
Demography and Health,

CO2: Develop survey questionnaire,

CO3: Design and carry out research and analyse data using any software package,

CO4: Write a detailed report of the scientific research carried out

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| SEMESTER IV | Course Code: DAS-CC-544 | Credits: 2 |
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NAME OF THE COURSE: DATA ANALYSIS USING SPSS

Course Outcomes:

CO1: Explain the assumptions used in statistical methods.

CO2: Analyse data using different statistical tools with the help of SPSS

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

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.

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

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

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

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

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| SEMESTER IV | Course Code: DAS-DE-545 | Credits: 2 |
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NAME OF THE COURSE: AGRICULTURAL INSURANCE

Course Outcomes:

- CO1:** Examine the knowledge of Indian agriculture and an overview of the agriculture insurance in India.
- CO2:** Explain the clear picture of the history of an Indian Agricultural Census.
- CO3:** Classify the Indian agriculture Insurance schemes (PCIS, CCIS, ECIS, NAIS, FIIS etc...)
- CO4:** Analyze benefits of crop insurance and the insurability of agricultural risk.
- CO5:** Demonstrate competency in understanding the Area approach based crop insurance suits the Indian conditions.

COURSE CONTENT

MODULE I: Introduction to Indian Agriculture- Agriculture Situation In India- Role of Agriculture in Indian Economy- agriculture Research & Network.

MODULE II: Agricultural Census-Phase I- Phase II- Phase III- Phase IV- Agricultural Resources- Land Records(Computerisation etc..)

MODULE III: Evolution of Crop Insurance In India - Individual Based Crop Insurance- Pilot Crop Insurance Scheme (PCIS)- Comprehensive Crop Insurance Scheme (CCIS), Experimental Crop Insurance Scheme (ECIS)- National Agricultural Insurance Scheme (NAIS)- Farm Income Insurance Scheme (FIIS)

MODULE IV: Agricultural insurance in India- Types of Agricultural Insurance schemes available- Obligations of Insurers in Rural Sector

MODULE V: Crop Insurance Design Considerations - Insurability of Agricultural Risks- Crop Insurance- Crop Insurance Vs Agricultural Relief- Crop Insurance As Risk Management- Benefits of Crop Insurance.

MODULE VI: Why Area Approach Based Crop Insurance Suits the Indian Conditions- Key Elements & Generic Considerations In Crop Insurance Design And Operations

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz

Learning Resources

References:

- Rao K.N (2010), 'Agricultural Insurance', Insurance Institute of India, Mumbai.
- Paul.K.Freeman, Howard Kunneuther, "Managing Environmental Risk Through Insurance", London, KLUWER ACADEMIC PUBLISHERS, 1997.

Assessment;

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

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| SEMESTER IV | Course Code: DAS-DE-546 | Credits: 2 |
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NAME OF THE COURSE: BASIC PRINCIPLES OF INVESTMENT

Course Outcomes:

CO1: Classify what are shares and stocks.

CO2: Examine the various stocks and shares available in the stock market.

CO3: How to calculate the methods of NAV, EPS, P/E ratio, Redemption yield etc

CO4: Analyze assimilate the basic principles of investment.

COURSE CONTENT

MODULE I: Company stocks and shares. Companies and their shareholders.

MODULE II: Settlement options, Transfer of title. Importance of a contract note.

MODULE III: Taxation, New issues, tax on capital gains, yield, flat yield, redemption yield.

MODULE IV: Assessment of ordinary shares, Net Asset per share, Earning per share. P/E ratio, Assessment of share prices.

MODULE V: protecting the unwary-prevention of fraud 1958. Licensed dealers rules 1960, equity linked life insurance.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions
- Quiz

Learning Resources

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)

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| SEMESTER IV | Course Code: DAS-GC-501 | Credits: 2 |
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NAME OF THE COURSE: ACTUARIAL SCIENCE

Course Outcomes:

CO1: Define Financial mathematics and Interest rate.

CO2: Contrast the duties and responsibilities of Actuaries in life, general and health insurance.

CO3: Classify the different types of risks

CO4: Analyze assimilate the basic principles of insurance.

COURSE CONTENT:

MODULE I: Financial mathematics-accumulation with simple interest, variable interest rate. Accumulation with compound interest, variable interest rate, nominal and effective interest rate, notion of discounting, present value of an ordinary annuity.

MODULE II: Role of an actuary, life table, basic concept of insurance, need for insurance.

MODULE III: Definition of risk, peril, hazard. Different types of risks, Definition of insurance and pricing of insurance products.

MODULE IV: Principles of indemnity, insurable interest, utmost good faith, subrogation and contribution.

MODULE V: Various insurance products, health insurance variants, annuities, life contingencies.

ACTIVITIES, LEARNING RESOURCES & ASSESSMENT

Suggested classroom Activities;

- Assignments
- Seminar presentations
- Debates & Discussions

- Quiz

Learning Resources

References:

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

Assessment;

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