SYLLABUS

B.Sc., ACTUARIAL MATHEMATICAL SCIENCE

2020 onwards

DEPARTMENT OF ACTUARIAL SCIENCE

BISHOP HEBERCOLLEGE (AUTONOMOUS)

(Nationally Reaccredited with A+ Grade by NAAC)

Tiruchirappalli – 620017

Sem.	Part	Course	Course Title	Course Code	Hours/ Week	Credits	Marks		
							CIA	ESE	Total
I	I	Tamil I /*	செய்யுள், இலக்கிய வரலாறு, உரைநடை, மொழிப்பயிற்சியும் படைப்பாக்கமும்.	U18TM1L1	6	3	25	75	100
	II	English I	English Communication Skills – I	U16EGPL2	6	3	40	60	100
	III	Core I	Introduction To Business Mathematics	U19AS101	5	4	25	75	100
		Core II	Differential Calculus And Its Applications	U20AS102	5	4	25	75	100
		Allied I	Descriptive Statistics	U19AS1Y1	4	4	25	75	100
	IV	Env. Studies	Environmental Studies	U16EST11	2	2	25	75	100
		Val. Edu.	Value Education (RI/MI)	U14VL1:1/ U14VL1:2	2	2	25	75	100
					Sem. I Credits :	22			
II	I	Tamil II /*	செய்யுள், இலக்கிய வரலாறு, சிறுகதைத்திரட்டு, மொழிபெயர்ச்சி , படைப்பாக்கம்.	U18TM2L2	6	3	25	75	100
	II	English II	English Communication Skills - II	U16EGPL1	6	3	40	60	100
	III	Core III	Introduction to Integral Calculus	U20AS203	6	5	25	75	100
		Core IV	Differential Equation & Its Application	U20AS204	6	5	25	75	100
		Allied II	Probability Theory &Discrete Distribution	U19AS2Y2	5	4	25	75	100
					Sem. II Credits :	20			
III	I	Tamil III /*	செய்யுள் - காப்பியங்கள் , இலக்கிய வரலாறு , நாவல், மொழிபெயர்ச்சி	U18TM3L3	6	3	25	75	100
	II	English III	English for Competitive Examinations	U16EGPL3	6	3	40	60	100
	III	Core V	Business Economics	U19AS305	5	4	25	75	100
		Elective I	Basic Accounting Concepts	U19AS3:1	5	4	25	75	100
		Allied III	Continuous Distributions & Estimation Theory	U19AS3Y3	4	4	25	75	100
		Allied IV	Introduction to R – Stat	U19AS3Y4	2	2	25	75	100
	IV	NMEC I	Introduction to Insurance	U19AS3E1	2	2	25	75	100
					Sem. III Credits :	22			
IV	I	Tamil IV /*	செய்யுள் - நாடகம், இலக்கிய வரலாறு, மொழிபெயர்ச்சி	U18TM4L4	5	3	25	75	100
	II	English IV	English through Literature	U16EGNL4	5	3	40	60	100
	III	Core VI	Sampling Theory and its Applications	U19AS406	5	4	25	75	100
		Allied V	Actuarial Profession	U19AS4Y5	5	4	25	75	100
		Allied VI	Introduction to Time Series	U19AS4Y6	4	4	25	75	100
	IV	SBEC I	Statistical Software and MS-Excel	U19ASPS1	2	2	40	60	100

		NMEC II	Financial Markets in India	U19AS4E2	2	2	25	75	100
		Soft Skills	Life Skills	U16LFS41	2	1	--	--	100
	V	Extension Activities	NSS, NCC, Rotract club, LEO club, etc.	U16ETA41	--	1	--	--	--
					Sem. IV Credits :	24			
	III	Core VII	Introduction to Stochastic process & Markov Model	U19AS507	6	5	25	75	100
		Core VIII	Mathematical Modeling	U19AS508	6	5	25	75	100
		Core IX	Mathematics of Finance – I	U19AS509	6	5	25	75	100
		Elective II	Data Analysis using MS – Excel	U19AS5:2	5	4	25	75	100
		Elective III	Group Insurance & Retirement benefit	U19AS5:3	5	4	25	75	100
	IV	SBEC II	Principles of Insurance	U19AS5S2	2	2	25	75	100
					Sem. V Credits :	25			
VI	III	Core X	Operations Research	U19AS610	6	5	25	75	100
		Core XI	Numerical Methods	U20AS611	6	5	25	75	100
		Core XII	Mathematics of Finance – II	U19AS612	5	5	25	75	100
		Core XIII	Basics of Life Contingencies	U19AS613	6	5	25	75	100
		Core XIV	Insurance Underwriting And Risk Management	U19AS614	5	4	25	75	100
		SBEC III	Mathematics for Competitive Examinations	U19AS4S3	2	2	25	75	100
	V	Gender Studies	Gender Studies	U16GST61	--	1	--	--	100
					Sem. VI Credits :	27			

Total Credits : 140

*** Other Languages : Hindi**	**Sanskrit**	**French**	**Hindi**	**Sanskrit**	**French**
Semester I: U18HD1L1	U17SK1L1	U18FR1L1	Sem III: U18HD3L3	U17SK3L3	U18FR3L3
Semester II : U18HD2L2	U17SK2L2	U18FR2L2	Sem IV : U18HD4L4	U17SK4L4	U18FR4L4

Part I: 4	Core Theory: 14	Allied: 6	NMEC: 2	Env. Studies : 1	Value Education : 1	Total : 40
Part II: 4	Elective : 3	SBEC : 3	Soft Skills : 1	Extension Activities : 1	Gender Studies : 1	

NMEC offered by the Department

1. Introduction to Insurance - U19AS3E1
2. Financial Markets in India -U19AS4E2

SEMESTER - I

INTRODUCTION TO BUSINESS MATHEMATICS

Semester: I **Core: I**

Hours: 5 **Code: U19AS101** **Credits: 4**

Objectives: To study the characteristic roots of the matrix. To study about the Transformation of equation, Binomial Expansions.

Unit I: Introduction to Business Mathematics: Introduction to Business Mathematics –Scope and Importance – Steps in Quantitative Analysis Approach – Set theory applications to Business - Matrix application to Business.

Unit II: Mathematical Induction to Binomial Theorem: Principle of Mathematical Induction – Binomial Theorem for a positive integer index- Properties of binomial coefficients – General term in the binomial expansion - Middle term in the binomial expansion – Greatest term in the binomial expansion – Binomial theorem for any index.

Unit-III: Progression – Its Application to Business: Arithmetic Progression – Geometric Progression – Harmonic Progression -Its applicaton to Business.

Unit IV: Exponential series- Exponential theorem (statement only) – Summation of series, Expansions and approximations. Logarithmic Series – Calculation of Logarithms - Summation of series, Expansions, Limits and approximations.

Unit V: General Summation of Series.

Text Books:

1. Business Mathematics - Dr P. Mariappan – Pearson – First Edition – ISBN 978-93-325-3634-0

   Unit I Chapter 1 : 1.1 and 1.2; Chapter 3: 3.16 and Chapter 16: 16.1, 16.2
   Unit II Chapter 8
   Unit III Chapter 9 : 9.5, 9.6, 9.7

2. T. K. Manickavasagam Pillay, T. Natarajan and K. S. Ganapathy, Algebra Volume – I. (Unit IV & V)

DIFFERENTIAL CALCULUS & ITS APPLICATIONS

Semester: I **Core: II**

Hours: 5 **Code: U20AS102** **Credits: 4**

Course Objectives

O1: To remember Function & Limits and to understand the rules for finding limits.

O2: Able to find the derivative of a function at a chosen input value.

O3: Differential Calculus is concerned with finding the instantaneous rate at which one quantity changes with respect to another.

O4: It helps us to calculate rates of changes even when those rates of change are not constant.

O5: To study various methods of differentiation and can able to find the nth derivative of a given function.

O6: To study Euler's method finding partial derivatives.

O7: To study the concept of some simple derivatives in economics.

O8: To make understand the concepts of monopoly, duopoly.

Unit I: Function and limits: Constants and variables – Function- Absolute value or modulus – Neighborhood of a Number – Limit of a Function - Theorems on limit – List of important results – Continuous Function.

Unit II: **Differentiation:** Slope and Rate of Change – Derivative [First Principle] – Method for Evaluating the Differential Co efficient using the First Principle and Standard Results – Derivative of Logarithmic function and Exponential Function – Chain rule – Differentiation of an Implicit Function – Logarithmic Differentiation – Successive Differentiation – Definition and Notations – Leibnitz's Theorem on Successive Differentiation.

Unit III: Partial Differentiation: Derivation of partial derivation – Successive partial derivation – Homogeneous function- Euler's theorem – Partial derivatives of a function of two functions. (Note: Simple Problem only)

Unit –IV: Functions and their application to Business: Introduction – Mathematical concepts related to Function – Functions related to Business – Elasticity – Concept of Maxima and Minima.

Unit –V: Multiple productions by monopolistic – Discriminating monopoly – Duopoly.

Text Books:

1. Dr Perumal Mariappan, Differential Calculus – An Application, New Century Book House, Pvt. Ltd, Chennai
   Unit I Chapter 1
   Unit II Chapter 2: 2.1 – 2.3, 2.5 – 2.7, 2.9;

Chapter 3
Unit IV Chapter 4

2. S. Narayanan & T. K. ManickavasagamPillay, Calculus Volume I, S. Viswanathan Pvt. Ltd, 2004.

   Unit III Chapter 8 §1.1,1.6,1.7

3. Mathematics for Economists- Mehta Madnani, Published by Sultan Chand &Sons (ISBN 81-7014-173-7)
   Unit V Chapter 11

Reference:

1. Business Mathematics, Dr P. Mariappan, Pearson Indian Education Service Pvt. Ltd., 2015; ISBN: 978-93-325-3634-0

DESCRIPTIVE STATISTICS

Semester: I **Allied: I**

Hours: 4 **Code: U19AS1Y1** **Credits: 4**

Objectives:

i. To know the various sources of data and its types.
ii. To make a clear understanding about the various types of presentation of data
iii. To have a depth knowledge in measures of central tendency & dispersion
iv. To analyze the bivariate data using correlation
v. To analyze the data by Fitting of Mathematical Models

Unit I: Data Structures, Data Sources & Data Collection: Introduction – Data Structures – Univariate data – Bivariate data – Multivariate data – Data Source.

Unit II: Data Presentation: Introduction – Classification of Data – Data presentation – Types of Variables – Levels of Measurements – Frequency – Types of Class interval – Tally Mark – Construction of a Discrete frequency distribution – Construction of a Continuous frequency distribution – Cumulative and relative frequencies – Diagrammatic representation of data.

Unit III: Analysis of Data (Univariate): Introduction – Measures of Central Tendency (Averages) – Arithmetic Mean – Median – Mode – Geometric Mean – Harmonic Mean – Graphical location of the partition values – Dispersion – Measures of Dispersion – Coefficient of Dispersion – Moments – Skewness – Kurtosis

Unit IV: Analysis of Data (Bivariate): Introduction – Meaning of Correlation – Scatter Diagram – Karl Pearson's Correlation Coefficient – Rank Correlation – Spearman's Rank Correlation – Problems.

Unit V: Analysis of Data (Fitting of Mathematical Models): Introduction – Lines of regression – Regression Coefficients – Properties of Regression Coefficients – Angle between Two lines of Regression – Standard Error of Estimate – Correlation coefficient between observed and estimated values.

Text Book:

1. Dr P. Mariappan, "Statistics for Scientific Solutions", New Century Book House [P] Ltd., 2008, ISBN: 81–234–1404–8.

   Unit I **:** Chapter 2
   Unit II **:** Chapter 3

2. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematics and statistics", Sultan Chand & Sons Publishers, 11th Edition, June 2002, ISBN: 81–8054–004–9.

   Unit III **:** Chapter 2 [Section: 2.4 to 2.9, 2.11 to 2.16]
   Unit IV **:** Chapter 10 [Section: 10.1 to 10.4, 10.6 to 10.7]
   Unit V **:** Chapter 11 [Section: 11.1 to 11.2]

Reference:

1. Study Material: Core Technical -3, Institute and Faculty of Actuaries (IFOA), 2018

SEMESTER - II

INTRODUCTION TO INTEGRAL CALCULUS

Semester: II **Core: III**

Hours: 6 **Code: U20AS203** **Credits: 5**

Course Objective:

O1: To study the properties of definite integrals.

O2: To compute different methods of multiple integrals.

O3: To know real time applications of definite integrals.

O4: To study the methods for solving multiple integrals.

O5: To know the reduction formula for sine and cosine functions.

O6: To investigate the properties for beta functions.

O7: To know the discounted value.

O8: To study the consumer's surplus.

Unit I: Integration of the forms (i) $\int[(px+q)/(\ ax2+bx+c\ )]dx$ (ii) $\int dx/(a+bcosx)$ -

Integration by parts.

Unit II: Definite integral- Properties of definite integral- Reduction formula $\int \sin^n x\ dx, \int \cos^n x\ dx, \int \tan^n x\ dx, \int_0^{\pi/2} \sin^n x\ dx\ and\ \int_0^{\frac{\pi}{2}} \cos^n x\ dx$ and simple problems.

Unit III: Multiple integral - Double integral – Triple integral- Change of order of integration.

Unit IV: Improper Integral – Gamma function – Beta function.

Unit –V: Application of Integral Calculus to Business – Cost function – Revenue function – Consumer's Surplus and Producer's Surplus – Producer's Surplus – Learning Curves.

Text Books:

1. Dr Perumal Mariappan, Integral Calculus – An Application, New Century Book House, Pvt.Ltd, Chennai.

Unit I	Chapter 2 § 2.12, 2.17
	Chapter 4
Unit II	Chapter 3 § 3.1, 3.2
	Chapter 5
Unit III	Chapter 7 § 7.1, 7.2, 7.3
Unit IV	Chapter 8 § 8.1, 8.2
Unit V	Chapter 9 § 9.1, 9.2, 9.3, 9.4, 9.5

Reference:

1. Business Mathematics, Dr P. Mariappan, Pearson Indian Education Service Pvt. Ltd., 2015; ISBN: 978-93-325-3634-0

DIFFERENTIAL EQUATIONS AND ITS APPLICATION

Semester: II **Core: IV**

Hours: 6 **Code: U20AS204** **Credits: 5**

Course Objectives:

O1: To identify the type of a given differential equations.

O2: To apply the appropriate analytical technique for finding the solution of differential equations.

O3: To solve the second order and higher order linear differential equations.

O4: To evaluate differential equations including separable, homogeneous, exact, and linear.

O5: To show existence and uniqueness of solutions.

O6: To create and analyze mathematical models using differential equations to solve application problems.

O7: To solve non homogenous equations

O8: To apply the concepts of differential equations in real life situations.

Unit I: Differential Equations – Differential Equation Types – Order and Degrees of Des – Solution to a Differential Equation – Formation of a Differential Equation – Linear Equations with Constant Coefficients – Auxillary equation having different roots – Auxillary Equation having Equal roots – Auxillary Equation having Imaginary Roots – The Equation of the form $f(D)y = X$ – when X is of the form e^{ax}, where a is a constant – when X is of the form $\sin ax$ or $\cos ax$ – when X is of the Algebraic form – When X is of the form $e^{ax}v(x)$.

Unit II: Exact Differential Equation – Methodology for resolving the exact equations – Rules for finding integrating factors for equating $Mdx + Ndy = 0$ – Rules for finding integrating factors for the equation $Mdx + Ndy \neq 0$ – Equations of the first order but not the first degree – Equations which can be solved for p – Equations solvable for y – Equations solvable for x – Clairaut's Equation – Equations homogenous in x and y.

Unit III: Formation of partial differential equation – General, Particular &complete integrals – Solution of PDE of the standard forms – Lagrange's method of solving – Charpit's method and a few standard forms.

Unit IV: PDE of second order homogeneous equation with constant coefficients – Particular integrals of $F(D, D,)z = f(x, y)$, where $f(x, y)$ is of one of the forms $e(ax + by)$, $Sin(ax + by), Cos(ax + by)$.

Unit V: Applications of differential equations: Cost function- Utility and demand analysis- Market equilibrium- Harrod- Domar Model.

Text Books:

1. Dr Perumal Mariappan, Differential Equations, New Century Book House, Pvt. Ltd, Chennai.

Unit I: Chapter 1 §1.0 – 1.1
Chapter 4
Unit II: Chapter 2 § 2.6 -2.6.3;
Chapter 3 §3.1 -3.5

2. S. Narayanan & T. K. ManickavasagamPillay, Calculus Volume III, S.Viswanathan Pvt. Ltd., 2004

Unit III: Chapter 4 § 1, 2, 2.1, 2.2, 3, 4, 5, 5.1 – 5.5, 6

3. Ordinary and partial difference equation M.D.Raisinghania

Unit IV Chapter 4.12,5.8,5.13

4. Mathematics for economists- Mehta Madnani,Published by Sultan Chand &Sons (ISBN1-7014-173-7)

Unit V Chapter 15-15.1,15.3

Reference:

1. Business Mathematics, Dr P. Mariappan, Pearson Indian Education Service Pvt. Ltd., 2015; ISBN: 978-93-325-3634-0

PROBABILITY THEORY & DISCRETE DISTRIBUTION

Semester: II **Allied: II**

Hours: 5 **Code: U19AS2Y2** **Credits: 4**

Objectives:

- To define basic probability and discrete Distributions.
- To explain the concepts of independence, jointly distributed random variables and conditional distributions, and use generating functions to establish the distribution of linear combinations of independent random variables.
- To explain the concepts of conditional expectation

Unit I: Theory of Probability: Introduction – Short History – Basic Terminology – Mathematical Probability – Statistical Probability – Subjective Probability – Mathematical Tools (Preliminary notions of Sets) – Axiomatic Approach to Probability – Addition theorem of Probability – Conditional Probability – Multiplication theorem of Probability – Multiplication theorem of Probability of independent – Extension of Multiplication theorem of Probability to $'n'$ events – Bayes' Theorem.

Unit II: Random Variables & Distribution functions: Introduction – Distribution Functions – Discrete Random Variable – Continuous Random Variable. **Two Dimensional random variable**: Joint Probability Mass Function – Joint Probability Distribution Function – Marginal Distribution Function – Joint Density Function – Marginal Density Function – Conditional Distribution Function – Conditional Probability density function – Stochastic Independence.

Unit III: Mathematical Expectation: Introduction – Mathematical Expectation – Expected value of function of a random variable – Properties of Expectation (Addition theorem and Multiplication theorem) – Properties of Variance – Covariance. **Generating Functions:** Moment generating function – Cumulants – Properties of Cumulants.

Unit IV: Bernoulli Distribution, Binomial Distribution and Poisson distribution: Bernoulli Distribution – Introduction to Binomial Distribution – Moments recurrence relation for the moments– mean deviation about mean, mode MGF – Additive property – Cumulants – Recurrence relation for Cumulants – Fitting of Binomial Distribution – Introduction to Poisson distribution – Moments – Mode – Recurrence relation for the moments – MGF – Characteristic function – Cumulants – Additive property – Fitting of Poisson Distribution.

Unit V: Negative Binomial Distribution, Geometric Distribution and Hyper geometric Distributions: Introduction to Negative Binomial Distribution – MGF of Negative Binomial Distribution – Cumulants – Poisson as limiting case – Geometric Distribution – Lack of memory concept– Moments of Geometric Distribution–Hyper geometric Distribution – Mean and Variance of Hyper geometric Distribution. Approximation to Binomial Distribution.

Text Book:

1. "Fundamentals of Mathematics and statistics" S.C. Gupta and V.K. Kapoor, Sultan Chand & Sons Publishers, 11th Edition, June 2002, ISBN: 81–8054–004–9.

Unit I	**:** Chapter 3 & 4	[Section: 3.1 to 3.14, 4.2]
Unit II	**:** Chapter 5	[Section: 5.1 to 5.4, 5.5.1 to 5.5.6]
Unit III	**:** Chapter 6	[Section: 6.1 to 6.6, 7.1 & 7.2]
Unit IV	**:** Chapter 7	[Section: 8.1 to 8.5]
Unit V	**:** Chapter 8	[Section: 8.6 to 8.8]

Reference:

1) "ActEd Study Material: Subject – CT3"

"Statistics for Scientific Solutions", Dr P. Mariappan, New Century Book House [P] Ltd., 2008, ISBN: 81–234–1404–8.

SEMESTER - III

BUSINESS ECONOMICS

Semester: III **Core: V**

Hours: 5 **Code: U19AS305** **Credits: 4**

Objectives: On completion of this course, the learner will

1. Understand the basic concepts of Business Economics
2. Know the dynamics of a market
3. Ascertain the importance of International trade and the financial system

Unit- I: Definition and Scope of Economics: Definitions of Economics – Differences between Micro and Macro Economics – Basic Economic Problems – Economic Systems.

Unit-II: Definition of Business Economics: Application of Economic Concepts in Business – Incremental Concept – Time Perspective – Discounting Principle – Opportunity Cost – Equi-marginal Principle – Objectives of Business Firms – Role and Responsibilities of Business Economists.

Unit-III: Liability Analysis of Demand and Supply: Characteristics of Human Wants – Utility Analysis – Law of Diminishing Marginal Utility – Law of Demand – Factors Influencing Demand – Demand Forecasting – Law of Supply – Factors Influencing Supply – Elasticity of Demand – Types – Factors Influencing Elasticity of Demand – Importance – Indifference Curve Analysis – Consumer Surplus.

Unit-IV: Cost, Revenue and Market Structure: Definition of Cost – Fixed and Variable Costs – Total Cost – Average Cost and Marginal Cost – Revenue – Average Revenue – Marginal Revenue – Total Revenue – Short-Run and Long-Run Cost Curves – Different Marker Forms – Price and Output Determination Under Perfect Competition, Monopoly monopolistic Competition and Duopoly – Price Discrimination – Pricing Strategies.

Unit V: Macro Economics: Objectives – Definition of National Income – Determination – Difficulties in Estimation – Economic Growth and Development – Business Cycles – Unemployment – Inflation – Fiscal and Monetary Policies – Foreign Trade – Features – Globalization – Merits and Demerits – Balance of Trade and Balance of Payments – Disequilibrium – Correcting Measures – IMF and IBRD – Objectives and Functions – Money and its Functions.

Text Book:

"Business Economics"-S. Sankaran .

References:

1. Dr. Deepashree (2005),Micro Economic Theory and Applications.
2. H.S. Agarwal(2008), Micro Economic Theory. Seventh Edition.
3. S. Sankaran (2004) Business Economics, 18th Edition.
4. R. Cauvery, U.K. Sudhanaya, M. Girija, N. Kirupalani and M.Meenakshi (2006), Micro Ecomomic Theory
5. K.K. Dewett (2005), Modern Economic Theory.

BASIC ACCOUNTING CONCEPTS

Semester: III		**Elective: I**
Hours: 5	**Code: U19AS3:1**	**Credits: 4**

Objectives:

1. To study the concepts of accounting and its recording procedures.
2. To study the basics of financial statements and ration analysis.

Unit 1: Accounting: Concepts - Types of accounts - Comparisons: Financial, Management and Cost accounting – Advantages and limitations of financial, -Management and cost accounting.

Unit 2: Accounting records and systems: Accounting equation - Accounting mechanics I: Journals Ledger posting and trial balance.

Unit 3: Accounting mechanics II - Preparation of financial statements – Trading account - Profit and loss account and Balance sheet.

Unit 4: Cash book and Subsidiary books: Single column cash book - Double column cash book - Three column cash book – Petty cash book –Purchase book – Sales book - Purchase Return book- Sales Return book.

Unit 5: Bank reconciliation statement – Rectification of errors - Depreciation accounting- Straight line method- Written down value method.

Text:

Dalston L. Cecil and Jenitra L. Merwin by "Principles of Accountancy"

Reference:

Jawaharlal and Seema Srivastava "Financial accounting"

CONTINUOUS DISTRIBUTIONS & ESTIMATION THEORY

Semester: III **Allied: II**

Hours: 5 **Code: U19AS3Y3** **Credits: 4**

Objectives:

a) To know about Continuous distributions
b) To learn Central limit theorem and its applications
c) To understand the key concepts of Maximum Likelihood Estimator and Confidence Intervals.

Unit I: Normal distribution – Uniform distribution – Gamma Distribution.

Unit II: Beta distribution – Exponential distribution – Weibull Distribution– Logistic distribution.

Unit III: Cauchy distribution – Central limit theorem.

Unit IV: Point Estimation: Introduction – Methods of moments – one parameter case – two parameter case – MLE – one parameter.

Unit V: Confidence Intervals: Introduction - Confidence Intervals in General - Confidence Intervals for Normal Distribution – Variance.

Text Book:

1. "Fundamentals of Mathematics and statistics" S.C. Gupta and V.K. Kapoor, Sultan Chand & Sons Publishers, 11th Edition, June 2002, ISBN: 81–8054–004–9.

   Unit I **:** Chapter 8 [Section: 9.1, 9.2]
   Unit II **:** Chapter 9 [Section: 9.5 to 9.8]
   Unit III **:** Chapter 9 [Section: 9.5 to 9.7]

2. "ActEd Study Material: Subject – CT3"

   Unit IV **:** Chapter 10
   Unit V **:** Chapter 11

Reference:

1) "Statistics for Scientific Solutions", Dr P. Mariappan, New Century Book House [P] Ltd., 2008, ISBN: 81–234–1404–8.

INTRODUCTION TO R - STAT

Semester: III		**Allied: IV**
Hours: 2	**Code: U19AS3Y4**	**Credits: 2**

Programs to be covered

1. Introduction to R
2. All Basic concepts of R
3. Graphical representation of Data using R
4. Concepts & Solving of Descriptive Statistical Poblems
5. Discrete Probability Distributions
6. Continuous Probability Distributions
7. Inferential Statistics – Testing of Hypothesis

INTRODUCTION TO INSURANCE

Semester: III **NMEC: I**

Hours: 2 **Code: U19AS3E1** **Credits: 2**

Objectives:

1. To learn the fundamentals of risks and its types.
2. To understand the insurance contract.

Unit 1: Risk Management: Meaning of risk – Types of risks – Risk analysis – Risk Management techniques – Risk retention.

Unit2: The concept of insurance and its evolution: Concept of insurance – Insurance (evolved and works) – Types of insurance – Importance of insurance industry.

Unit 3: The Business of Insurance: How risk is managed by individuals and insurers – premium – importance of reinsurance- role of insurance in economic development and society.

Unit 4: The insurance contract: Introduction – Insurable interest – Principle of indemnity – Subrogation and contribution – Utmost good faith- Proximate cause.

Unit 5: Life insurance products: Traditional products – Linked products – Annuities and group policies.

Text Book:

"Principles of Insurance" – IC 01 - III

Reference:

1. Dorfman S. Mark, introduction to risk management and insurance prentice hall India 2005.
2. George E. Rejda, Principles of Risk Management and Insurance.
3. Emmett J. Vaughan, Therese M. Vaughan, Essentials of Risk Management and Insurance.
4. Edition 2002 Jr., C. Arthur C Williams, Peter C Young, Michael L. Smith, "Risk Management & Insurance".
5. Risk management by Hull.

SEMESTER - IV

SAMPLING THEORY AND ITS APPLICATION

Semester: IV **Core: VI**

Hours: 5 **Code: U19AS406** **Credits: 4**

Objectives: (I) To explain the concepts of random sampling, statistical inference and sampling distribution, and state and use basic sampling distributions. (II) To describe the main methods of estimation and the main properties of estimators, and apply them. (III) To construct confidence intervals for unknown parameters. (IV) To Test hypotheses. (V) To explain the concepts of analysis of variance and use them.

Unit I: Sampling: Introduction – Types of Sampling – Sampling Distribution – Test of Significance – Null Hypothesis, Alternative Hypothesis – Errors in Sampling – Critical region and Level of Significance- main methods of estimation and the main properties of estimators.

Unit II : Testing of Hypothesis: Test of Significance of Large Samples – Sampling of Attributes – Test for Single proportion – Test for Difference of Proportion – Unbiased estimates for population mean and population variance – Standard error of sample mean – Test of significance for single mean - Test of significance for difference of means – test of significance of standard deviation.

Unit III: Chi square Distribution: Introduction – MGF of Chi square distribution – Cumulative Generating Function of chi square distribution – Limiting form of chi square distribution – Mode and skewness of chi square distribution – Application of chi square distribution – Chi Square for population variance – Chi square test for Goodness of fit – Independence of Attributes.

Unit IV: Students "t" Distribution introduction – Deviation of Student's "t" Distribution – Application of t-test – t-test for single mean – t-test for difference of means.

Unit V: F- Statistics – Derivation of F Distribution – Constants of F Distribution – Application of F Distribution – F Test for equality of population variance – Relationship between t and F distribution – Relation between F and χ^2 . Fisher's Z distribution – MGF of Z distribution - Fisher's Z transformation - Analysis of Variance.

Text Book:

Fundamentals of Mathematical Statistics by S.C. Gupta and V. K. Kapoor

Unit I: Chapter 12 (12.1 – 12.7) Unit II: Chapter 12 (12.7.1 – 12.1.15)

Unit III: Chapter 13 (13.1 – 13.7.3) Unit IV: Chapter 14 (14.1 – 14.2.10)

Unit V: Chapter 14 (14.5 – 14.8)

Reference:

1. Statistics for Scientific Solutions, Dr P. Mariappan, New Century Book House [P] Ltd.,2008, ISBN: 81-234-1404-8

ACTUARIAL PROFESSION

Semester: IV		**Allied: V**
Hours: 5	**Code: U19AS4Y5**	**Credits: 4**

Objectives:

- To study the different types of insurance.
- To develop the current scenario of profession.

UNIT-1: Actuarial Profession Overview - Introduction to profession and professionalism - Evolution of Actuarial Profession - Characteristics of the ideal profession - characteristics of Actuarial profession - Skills required for the Actuary.

UNIT-2: Self-Regulatory Measures in Actuarial profession - Need for self-regulation - Definition – Introduction - Classification of guidance notes – Procedures - Criteria for insurance of guidance notes.

UNIT-3: Role of Actuaries - Role of Actuary in Life Insurance Business - Valuation of Liabilities - Profit distribution - Product Design and Product pricing - Assessment of solvency - Investigation of Investment policy - Investigation of New Business Risks.

UNIT-4: Role of Actuary in General Insurance - Premium rating-Estimation of Liabilities-Collection and Presentation of information - Reinsurance requirements.

UNIT-5: Role of Actuary in Health Insurance & Other Area - Health Insurance-Demography - Economics-Climate - State provision of Health and care services - Valuation of Insurance Companies - Investment Actuary - Advisors of Brokers - Financial Consultant - Corporate Finance – Academics - Capital Projects.

Textbook:

CT 9 - Business Awareness Module.

Chapter: 4.1 and 4.2**.**

INTRODUCTION TO TIME SERIES

Semester: IV **Allied: VI**

Hours: 4 **Code: U19AS4Y6** **Credits: 4**

Objective: (I) To Define the Index Number, (II) To study various methods to calculate Index Number (III) To Define Time series and its various methods.

Unit I: Index Numbers - Introduction – Meaning – Definition – Characteristics – Uses – Types of Index Number – Interpretation of Index Numbers – Problems of Construction – Choice of Formula – Methods of Construction – Laspeyre's Method – Paasche's Method – Dorbish and Bowley's Method - Fisher's Ideal Method – Marshall-Edgeworth method – Kelly's Method – Walsch's Method.

Unit II: Quantity Index Numbers - Value Index Numbers – Time Reversal Test – Factor Reversal Test – Circular Test – Chain Base – Fixed Base – Base Shifting – Deflating of Index Numbers – Consumer Price Index – Family Budget – Limitations of Index Numbers.

Unit III: Time Series – Meaning – Definition – Uses of Time Series – Models – Secular Trend – Seasonal Variation – Cyclical Variation – Irregular Variation – Preparation Data for Analysis – Measurement of Secular Trend – Graphic Method – Semi average Method – Moving Average method – Method of Least Squares - Parabola Curve - Selecting a type of trend – Choice – Conversion – Shifting to origin.

Unit IV: Measurement of Seasonal Variation – Method of simple average method – Ratio to trend Method – Ratio to Moving average method – Link relative method – Measurement of Cyclical Variation – Measurement of Irregular Variations.

Unit V: Interpolation and Extrapolation – Meaning - Significance of Interpolation – Assumptions – Methods of interpolation – Graphic – Algebraic – Binomial Expansion Method – Newton's Method of Advancing Differences – Newton's Gauss (Forward) Method - Newton's Gauss (Backward) Method – Newton's Method of Backward - Newton's divided difference method – Lagrange's method and parabolic curve fitting .

Text Book:

"**Statistics theory and Practice**" By R.S.N. Pillai and Bagavathi, S. Chand Publishers. Reprint 2013

Unit 1 Chapter 14 (Pages 526 – 536)

Unit 2 Chapter 14 (Pages 538 – 555)

Unit 3 Chapter 15 (Pages 591 – 615)

Unit 4 Chapter 15 (Pages 615 – 625)

Unit 5 Chapter 16 (Pages 647 – 668)

STAT LAB – STATISTICAL SOFTWARE & MS-EXCEL (PRACTICAL)

Semester: IV		**SBEC: I**
Hours: 2	**Code: U19ASPS1**	**Credits: 2**

Unit I: Research – Research Design and Planning statistics and Research – Collection of Data – Preparing Questionnaire – Types of Scales – Measurement Scales – Introduction to Statistical Software & MS-Excel – Creating Data Base using Statistical Software and MS-Excel – Defining Variables.

Unit II: Diagrammatic and Graphical representation: Simple Bar Diagram – Multiple Bar Diagram - Sub divided bar diagram – Line Diagram – Histogram – Frequency Curve – Pie chart – Stem and Leaf - Dot Plot - Box Plot.

Unit III: Measures of Central Tendency: Arithmetic Mean- Median – Mode – Geometric Mean – Harmonic Mean- **Measures of Dispersion:** Range – Average deviation – Standard Deviation – Skewness – Kurtosis.

Unit IV: Correlation Analysis – Scatter Diagram - Karl Pearson's Correlation Coefficient – Spearman's Rank Correlation Coefficient

Unit V: Testing of Hypothesis: X^2 test - t- test - Paired t- test - Z- test – ANOVA test.

Text Book:

Study Material – By Department of Actuarial Science

Reference:

Ms – Excel 2007 Manual

SPSS 20 Manual

FINANCIAL MARKETS IN INDIA

Semester: IV **NMEC: II**

Hours: 2 **Code: U19AS4E2** **Credits: 2**

Objective: To enable the students to acquire the basic understanding of the structure, organization and functioning of the Financial System in India. The course also aims at exposing the students to new financial instruments and their implications in the existing regulatory framework.

Unit-1: Financial Systems: Meaning - Role and functions of a financial system - Organized and Unorganized financial system – Components - Financial Assets - Financial Inter - Medians.

Unit-2: Meaning – Instruments - New Issue Market - Features-Objectives - Functions-Constituents or players and problems.

Unit-3: Secondary Markets: Meaning - Functions of Stock Exchange - Benefits to the Community – Investors – Companies - Listing of Securities and its benefits - Companies of BSE, NSE, OTCEI.

Unit-4: Money Markets: Meaning - Features of Organized and Unorganized Money Markets - GRS instruments of money market.

Unit-5: Money Market Institutions: Meaning - Role of the Central Bank (RBI) in money markets - Commercial Banks – Meaning – Functions - Indigenous Financial Agencies – Bankers - Money Lenders - Discount Houses - Accepting Houses (only Meaning & Features).

Text Books:

1. "Financial Markets and Services" - Dr. L. Natarajan

2. "Financial Services" – B. Santhanam

Unit I: The Indian financial system and Development- Vasant Desai, Himalaya Publishing House.

Unit II, III & IV: Financial Markets and Institutions-Dr. S. Gurusamy,Tata McGraw Hill.

Unit V: The Indian Financial System-Dr. BhartiPathak, Pearson.

SEMESTER –V

For the candidates admitted in the academic year 2018 onwards

INTRODUCTION TO STOCHASTIC PROCESS & MARKOV MODEL

Semester: V		**Core: VII**
Hours: 6	**Code: U19AS507**	**Credits: 5**

Objectives:

- To providing the knowledge to Stochastic process & Poisson process
- To understand Markov chains & Models

Unit I: Stochastic processes: Introduction – Types – Counting processes – Sample paths - White noise - Stationary – Strict stationary – Weak stationary – Increments – Independent increments. (Concept & Simple problems only)

Unit II: Poisson process – Sums of Poisson process – Thinning of Poisson process – Inter - Event times in a Poisson process. (Concept & Simple problems only)

Unit III: Definitions of l_x, p_x, q_x, ${}_np_x$, ${}_nq_x$, m/ ${}_nq_x$, - Concept of force of mortality μ_x - Derivation of ${}_np_x$ in terms of μ_x – Laws of mortality.

Unit IV: Markov chains: Markov process – Markov property – The transition Matrix - Random walks. (Concept & Simple problems only)

Unit V: Chapman - Kolmogorov equations – Time-homogeneous Markov chains - Irreducible chains – Periodicity. (Concept & Simple problems only)

TEXT BOOK:

Models – IAI Material – CT- 4

Unit I & II – Chapter 2

Unit III – Chapter 7

Unit IV & V – Chapter 3

MATHEMATICAL MODELLING

Semester: V **Core: VIII**

Hours: 6 **Code: U19AS508** **Credits: 5**

Objectives:

1. To introduce the basic concepts of modelling.
2. To study the different mathematical models involving differential equations, graph theory etc.

Unit I: Ordinary differential equation – Linear growth model – Growth of science and scientists – Non-linear growth and decay models – Diffusion of glucose or a medicine in the bloodstream.

Unit II: Modelling in population dynamics – Prey-predator models – Competition models – Multi-species models – Modelling of epidemics – Simple epidemic models – A model for diabetic-mellitus.

Unit III: Modelling through difference equations – Linear difference equation – Obtaining complementary function by use of matrices – Harrods model – cob-web model – Applications of Actuarial science.

UNIT – IV: Cash flow process – Net present value and accumulated profit – Internal rate of return – Payback period – Discounted payback period.

Unit –V: Models for short term insurance contracts - Collective risk model- Compound distribution - Surplus process – Linear predictor model.

Text Book:

J. N. Kapur, Mathematical Modelling, Wiley Eastern Limited, New Age International Pvt. Ltd., Reprint 2001.

Unit I: Chapter 2 § 2.1 – 2.3, 2.4.2

Unit II: Chapter 3 - 3.1.1 – 3.1.3, 3.2.1 & 3.5.1

Unit III: Chapter 5 § 5.2.1 – 5.2.6, 5.3.1, 5.3.2 & 5.3.4

Unit IV: Chapter 10 – CT1

Unit V: CT6 – Risk models, Ruin theory, generalized linear models.

Reference(s)

1. J. N. Kapur, Mathematical Models in Biology and Medicine, New Delhi, 1985.

2. R. Olink, Mathematical Models in Social and Life Sciences, 1978.

3. CT1, CT6

MATHEMATICS OF FINANCE-I

Semester: V **Core: IX**

Hours: 6 **Code: U19AS509** **Credits: 5**

Objectives: To describe how to use a generalized cash-flow model to describe financial transactions. To describe how to take into account the time value of money using the concepts of compound interest and discounting. To define and use the more important compound interest functions, including annuities certain.

Unit I: Cash flow Model: Cash Flow Process – Examples of Cash flow Scenarios – Zero Coupon Bond, Fixed Interest Securities, Index Linked Securities, and Cash on Deposit, Equity, Annuity, An Interest Only Loan, and Repayment Loan.

Unit II: The Time Value of Money: Simple Interest, Compound Interest, Simple Discount, Interest Rates: Accumulation Factors – Principles of Consistency.

Unit III: Discounting and accumulating: Present Values– Accumulated values – The Basic Compound Interest Functions.

Unit IV: Level Annuities: Present Values – Payments Made in Arrear, Payment Made in Advance – Accumulations – Perpetuities.

Unit V: Investments: Characteristics of Fixed interest Govt. bonds – Index linked Govt. bonds- Govt. bills – Ordinary Shares – Property – Certificate of deposit.

Text Books:

1. ActEd Study Material: Subject - CT1
2. Mathematical basis of life insurance – IC81 – Insurance Institute of India material

REFERENCE:

1. Actuarial Mathematics. Bowers, Newton L et al. – 2nd ed. – Society of Actuaries, 1997.xxvi, 753 pages. ISBN: 0 938959 46 8.
2. Business Mathematics, Dr P. Mariappan, Pearson Indian Education Service Pvt. Ltd., 2015; ISBN: 978-93-325-3634-0

For the candidates admitted in the academic year 2018 onwards

Data Analysis Using MS-Excel

Semester: V		**Elective: II**
Hours: 5	**Code: U19AS5:2**	**Credits: 4**

Objectives:

i. To know about the basic formatting and editing options
ii. To get deep information about Conditional formatting and its styles using Excel
iii. To study about creating pivot tables & pivot charts in MS-Excel
iv. To use the Lookup & IF functions for sorting data
v. To study the purpose of using macros function in the workbook

Unit I: Creating new workbooks – Saving workbooks – Opening Workbook - Closing Workbook – Selecting cells – Entering text into cells – Entering numbers into Cells – Auto Complete – Pick from drop-down list – Using the "Window" Command group – Switching to Full screen view – Renaming workbooks – Working with Excel file Formats.

Unit II: Basic Functions – Mail merge – Conditional Formatting – Finding cells with conditional formatting – Clearing conditional formatting – Using table and cell styles

Unit III: Creating Pivot tables and Pivot charts – Manipulating a pivot table – Changing calculated value fields – Applying pivot table styles – Creating pivot chart – Setting pivot table options – Sorting & Filtering pivot table data.

Unit IV: The Horizontal lookup & Vertical lookup Functions – Using IF, AND, & OR functions

Unit V: Recording Macros – Running & deleting Recorded Macros – The Personal Macro Workbook.

Textbook:

1. Wayne L. Winston, Microsoft Excel: Data Analysis & Business Modeling, 2010

Reference Books:

1. John, Walken bach, Microsoft excel 2016 bible: The comprehensive tutorial resource wiley, 2016

Group Insurance & Retirement benefits

Semester: V **Elective: III**

Hours: 5 **Code: U19AS5:3** **Credits: 4**

Objectives: To give a brief introduction to the various Retirement benefits and group Insurance schemes available in Indian Financial Markets.

Unit I: Historical background to employee benefits in India: Provident funds – Super-annuation - Gratuity schemes.

Unit II: Group Insurance Schemes: Segments of group schemes market – Origin and development of group schemes characteristics of groups – group underwriting, rate making and experience rating adjustment.

Unit III: Gratuity and Superannuation Schemes: Different ways of arranging schemes – Unfunded schemes and funded schemes – Trustee administered and insured schemes.

UNIT IV: Methods of costing: past service benefits and future service benefits – annual premium and single premium – method of costing, definite funding and indefinite funding and controlled funding.

Unit V: Legal aspects and taxation: Treatment of retirement provisions under provident, gratuity and superannuation funds – Documentation of Trust deeds and Rules. Data processing and Group Schemes.

Text Book:

IC 83 of Insurance Institute of India.

PRINCIPLES OF INSURANCE

Semester: V **SBEC: II**

Hours:2 **Code: U19AS5S2** **Credits: 2**

Objectives: To study the concepts of Insurance and its Operations

Unit I: Risk Management: Meaning of risk – Types of risks – Risk analysis – Risk Management techniques – Risk retention - **Insurance**: Insurance – Concept and scope – Nationalization of Insurance in India in 1972 structure of Insurance in India –Privatization and Globalization of Insurance in India.

Unit II: The Insurance market: Indian insurance market – Intermediaries – Specialists – Regulator and other bodies. **The insurance contract**: Introduction – Insurable interest – Principle of indemnity – Subrogation and contribution – Utmost good faith- Proximate cause.

Unit III: General Insurance: Need for General Insurance – Reinsurance – Importance – Fundamentals – Specific terms used in reinsurance – Types of General Insurance – Fire insurance – Definition – Causes of fire – Essential characteristics of fire insurance contracts – Procedures – Rate fixation – Kinds of fire insurance policies – Policy conditions - Claim settlement.

Unit IV: Marine Insurance: Marine Insurance – Definition – Marine Risk – Essential Characteristics of marine insurance – Procedures for taking out policy – Types of policy – Cargo & Hull – Policy conditions.

Unit V: Life insurance products: Traditional products – Linked products – Annuities and group policies.

Text Book:

"Principles of Insurance" – IC 01 – III

Reference:

1. Dorfman S. Mark, introduction to risk management and insurance Prentice hall India 2005
2. George E. Rejda, Principles of Risk Management and Insurance.
3. Emmett J. Vaughan, Therese M. Vaughan, Essentials of Risk Management and Insurance
4. Risk management by HullEdition 2002 Jr., C. Arthur C Williams, Peter C Young, Michael L. Smith, "Risk Management & Insurance".

SEMESTER – VI

OPERATIONS RESEARCH

Semester: VI **Core: X**

Hours: 6 **Code: U19AS610** **Credits: 5**

Objectives: To introduce the field of operations research is to apply in management techniques, to help students to find optimum solutions in business and management problems.

Unit I: Origin and development of O.R. – Nature and features of O.R. – Scientific methods in O.R. – Methodology of operations research – Applications of O.R. – Opportunities and shortcomings of O. R. – Formulation of L.P.P. - Graphical solution -General L.P.P, Canonical and standard forms of L.P.P.

Unit II: Simplex methods to solve LPP (Ordinary Simplex method, Big-M-method, Two-phase-Simplex method).

Unit III: Duality in L.P.P- Introduction, General primal – Dual pair, formulating a dual problem, Dual simplex method – Sequencing.

Unit IV: Introduction – General transportation problem (theorems are not included) – the transportation problem – Finding an initial basic feasible solution – Degeneracy in transportation problem – MODI method – Some exceptional cases.

Assignment problem: Introduction – Mathematical formulation of the problem – The assignment method.

Unit V: Introduction – Network and basic components – Logical sequencing – Rules of network construction – Critical path Analysis – Probability consideration in PERT – Distinction between PERT and CPM.

Text Book:

Operations Research – An Introduction, Dr P. Mariappan, Pearson; 1 edition (May 1, 2013),ISBN-10: 8131799344, ISBN-13: 978-8131799345, ASIN: B00FJVEVEQ

Unit I § chapter-1; chapter -2 [2.1 to 2.10]

Unit II § chapter-2 [2.11 to 2.13]

Unit III § Chapter-2 [2.14 and 2.15]; chapter-7

Unit IV § chapter – 4 and chapter-5

Unit V § chapter - 6[6.1 to 6.5]

NUMERICAL METHODS

Semester: VI **Core: XI**

Hours: 6 **Code: U20AS611** **Credits: 5**

Course Objective

O1: To introduce different numerical techniques.

O2: To solve Algebraic and differential equations.

O3: To develop skills in solving problems using numerical techniques.

O4: To solve the forward differences problems.

O5: To Solve Taylor Series problems.

O6: To Know solving predictor problems.

O7: To solve Corrector problems.

O8: To know Jacobi Techniques

Unit I: Introduction to numerical analysis – The solution of algebraic and transcendental equations – Bisection method – Iteration method – Regula-Falsi method - Newton- Raphson method.

Unit II: Linear System of Equations– Gauss elimination method – Gauss-Jordan method – Iterative methods – Jacobi method – Gauss-Seidal method.

Unit III: Finite differences –Interpolation - Introduction – Gregory-Newton interpolation formulae – Interpolation with unequal intervals – Lagrange's interpolation formula.

Unit IV: Numerical differentiation and integration – Newton's formulae to compute the derivative – Numerical integration – A general quadrature formula – Trapezoidal rule - Simpson's one third rule – Simpson's three-eighth rule.

Unit V: Numerical solution of ordinary differential equation – Taylor series method – Euler's method – Runge-Kutta methods – Adam's Moulton Method – Milne's Predictor corrector method.

Text Book:

Dr Perumal Mariappan, Numerical Methods for Scientific Solutions, New Century Book House, Pvt. Ltd, Chennai.

Unit I	Chapter 1 § 1.1, 1.2; Chapter 2 § 2.1 – 2.5
Unit II	Chapter 3 § 3.3 – 3.6
Unit III	Chapter 4 § 4.1 -4.7; Chapter 5 § 5.1 - 5.5
Unit IV	Chapter 7§ 7.1 – 7.4, 7.41, 7.42, 7.43
Unit V	Chapter 6§ 6.1, 6.2, 6.4, 6.6, 6.7

Reference:

P. Kandasamy, K.Thilagavathy, K. Gunavathy, Numerical Methods, S. Chand & company limited, New Delhi, 2nd Revised Edition, 2003.

MATHEMATICS OF FINANCE – II

Semester: VI **Core: XII**

Hours: 5 **Code: U19AS612** **Credits: 5**

Objectives: To define an equation of value**,** Describe how a loan may be repaid by regular installments of interest and capital.

Unit I: Deferred and increasing annuities: - Introduction - Deferred annuities - Annual payments (arrear and Advance) - Increasing annuities- Annual payments (arrear and Advance) - Decreasing payments.

Unit 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 (I or R)- Solving for the timing of a payment (n) - Solving for the interest rate *i.*

Unit III: Loan schedules-Introduction-An example- Calculating the capital outstanding – Introduction-The theory - Prospective loan calculation -Retrospective loan calculation.

Unit IV: Calculating the interest and capital elements of the Loan schedule - Single payment – Series of payments – Forming the loan schedule - Consumer credit: flat rates and Annual Percentage Rate.

Unit V: Project appraisal- MWRR, TWRR, LIRR.

NB: The force of interest and the nominal rate of interest are not used for this paper

Text Books:

1. **ActEd Study Material:** Subject - CT1

REFERENCE:

1. **Actuarial mathematics.** Bowers, Newton L et al. – 2nd ed. – Society of Actuaries, 1997. xxvi, 753 pages. ISBN: 0 938959 46 8.
2. **An introduction to the mathematics of finance.** McCutcheon, John J; Scott, William F. London: Heinemann, 1986. 463 pages. ISBN: 0 434 91228 x.
3. **Mathematics of compound interest.** Butcher, M V; Nesbitt, Cecil J. Ulrich's Books, 1971. 324 pages.
4. **Theory of financial decision making.** Ingersoll, Jonathan E. Rowman& Littlefield, 1987. 474

BASICS OF LIFE CONTINGENCIES

Semester: VI		**Core: XIII**
Hours: 6	**Code: U19AS613**	**Credits: 5**

Objectives:(i) To define simple assurance and annuity contracts, and develop formulae for the means and variances of the present values of the payments under these contracts, assuming constant deterministic interest.(ii) To describe practical methods of evaluating expected values and variances of the simple contracts defined in objective (i).(iii) To describe and calculate net premiums and Gross premium for simple insurance contracts.

Unit I: Life Table: Introduction – Constructing a life table – The force of Mortality – Using the life table – Life table functions at non–integers ages – UDD – CFM – Select Mortality – Constructing Select & Ultimate life tables.

Unit II: Life Assurance Contract: The sum Assured is payable not on death - Introduction – Whole life assurance – Term Assurance- Pure endowment Assurance- Endowment Assurance – Deferred Assurance benefits (Concept & simple problems only)

Life Assurance Contract - The sum Assured is payable immediately on death - Introduction – Whole life assurance – Term Assurance- Endowment Assurance – Deferred Assurance Benefits – Other relationships (Concept & simple problems only)

Unit III: Life Annuity Contract: Introduction – Whole life annuity (due and arrear)-Temporary annuity (Due and Arrear) - Deferred annuities (Due & arrear) - Continuous annuities (Concept & simple problems only)

Unit IV: Net Premiums and Reserves: Introduction - Premiums - Frequency Of Payment – The Net premium- Definition – Notation – The Insurer's loss Random variable – Retrospective accumulation – Reserves – Net Premium Reserves – Recursive calculation of reserves

Unit V: Mortality, selection and standardization: Principal factors contributing to variation in mortality and morbidity – Selection – Selection in life assurance and pensions business – Life assurance – Pension funds – Why it is necessary to have different mortality tables for different classes of lives – How decrements can have a selective effect – Risk classification in life insurance – Impact of genetic information on risk classification in life insurance – Single figure indices – Crude mortality rate – Directly standardized mortality rate – Indirectly standardized mortality rate – Standardized mortality ratio.

Text Book: Unit 1 – CT-5 – Chapter – 3 (only from Material)

Unit 2 – IC 81 – (III Book)

Unit 3 – IC 81 – (III Book)

Unit 4 – CT 5 - Chapter – 5 (only from Material)

Unit 5 – CT 5 - Chapter – 14 (only from Material)

Reference:

1. "Actuarial Mathematics for Life Contingent Risks" – Author: David C. M. Dickson, Mary R. Hardy, Howard R. Waters

2. Actuarial mathematics. Bowers, Newton L et al. – 2nd ed. – Society of Actuaries, 1997. xxvi, 753 pages. ISBN: 0 938959 46 8.

3. Life contingencies. Neill, Alistair. – Heinemann, 1977. vii, 452 pages. ISBN 0 43491440 1.
4. Life insurance mathematics. Gerber, Hans U. – 3rd edition – Springer. Swiss Association of Actuaries, 1997.217 pages. ISBN 3 540 62242 X.

INSURANCE UNDERWRITING AND RISK MANAGEMENT

Semester: VI **Elective: IV**

Hours: 5 **Code: U19AS6:4** **Credits: 4**

Objectives:

- To introduce the concept of insurance.
- To study the different types of insurance underwriting
- To develop the current scenario of insurance.

Unit I: **Risk management in insurance** – Meaning of Risk – Types of Risk – Objective risk - Risk management – Risk management Strategies - Risk management process- Risk financing.

Unit II: **Financial Underwriting**: Purpose of financial underwriting - Objectives of financial underwriting - Concept of Insurable interest & Insurable value - Personal Insurance Cover - Human Life Value.

Unit III: Role of surveyors in non-life insurance – Operational risks – Disaster risk financing – Non insurance transfers.

Unit IV: Risk management matrix – Risk management techniques – Professionals in risk management – Emerging risks – Challenges in risk management.

Unit V: Introduction - Forms of reinsurance – Methods of reinsurance – Reinsurance arrangement – Excess of loss reinsurance with insurer and reinsurer – Proportional reinsurance with insurer and reinsurer.

References:

- Elements of Insurance by Dr E. Dharmaraj, SIMERS Publication.
- Reinsurance management IC- 85 by III.
- CT-6

MATHEMATICS FOR COMPETITIVE EXAMINATIONS

Semester: VI		**SBEC: III**
Hours: 2	**Code: U19AS4S3**	**Credits:2**

Objectives: To develop Arithmetic and Aptitude skills.

Unit I: Civil Service examinations - UPSC, SSC, Railway, Defence, Public & Security, Bank Recruitment and other Miscellaneous examinations.

Unit II: Numerical ability tests, intelligence tests, reasoning tests – Statistical analysis – figural relation – Behavioral ability – Comprehension – Evaluation, Retention.

Unit III: Numbers- HCF & LCM - Decimal Fractions - Simplification – Square roots and Cube roots – Percentage - Average-Ratio and Proportion – Profit and Loss.

Unit IV: Time and Work - Time and Distance - Problems on Trains – Problems on Numbers - Problems on ages - Simple interest - Compound interest.

Unit V: Area-Volume & Surface Areas - Chain rule - Calendar-Stock & Shares - Banker's discount - Data analysis - Odd man out & Series.

Reference:

R.S. Aggarwal, Objective Arithmetic, S.Chand and Company Ltd., New Delhi, 2003.