B.Sc., ACTUARIAL MATHEMATICAL SCIENCE
SYLLABUS
(Under Choice Based Credit System)
(For the Students admitted in the academic year 2021-22)

PG DEPARTMENT OF ACTUARIAL SCIENCE

BISHOP HEBER COLLEGE (AUTONOMOUS)

(Nationally Reaccredited with 'A' Grade by NAAC with a CGPA of 3.58 out of 4)

(Recognized by UGC as "College of Excellence")

Tiruchirappalli – 620 017

PG DEPARTMENT OF ACTUARIAL SCIENCE
Programme: B. Sc., Actuarial Mathematical science

Vision:

To build a center of excellence in actuarial and current business trends to sort after professionals who develop and communicate solutions for complex financial issues of nation and also inculcating values in order to address the problems of humanity.

Mission

1. Our curriculum includes a capstone course that integrates education in professional standards, ethics and practical application of actuarial theory with commonly used actuarial models, software and technologies.

2. To offer multiple areas of concentration for actuarial science majors such as life, health, property, casualty or enterprise risk management

3. To enable the students to become well-educated graduates who can make significant contributions to the financial security of individuals, corporate organizations and society through the ability to identify, quantify, assess and manage risk and uncertainty.

PROGRAMME OUTCOMES

PO No.	Upon completion of the B.Sc. Degree Programme, the graduate will be able to
PO1	Demonstrate knowledge of various fields related to actuarial science such as mathematics, statistics, economics, finance and accounting
PO2	Use software packages and information technologies to solve practical problems in actuarial profession
PO3	Apply the knowledge of actuarial concepts for solving problems related to insurance sector
PO4	Master the quantitative and analytical skills required to obtain an entry-level position in the actuarial science profession.
PO5	Demonstrate the skills necessary for passing the professional actuarial exams
PO6	Be able to clearly communicate results from an actuarial analysis to all stakeholders, and write effective reports that describe the analysis and summarize important findings.
PO7	Adopt to technological changes and demands through self-DIRECTed and lifelong learnings
PO8	Able to bring actuarial, financial, mathematical, and statistical techniques to model and analyze risks, particularly in insurance sector.
PO9	Practice professional ethics with social responsibility.

PROGRAMME SPECIFIC OUTCOMES

PSO No.	Upon completion of the B.Sc. Degree Programme, the graduate will be able to
PSO 1	Analyze the important issues of industries including insurance, government, business and academic research with suitable approach for solutions.
PSO 2	Predict uncertain events for insurance policy income, pension scheme pay-outs and stock market performance.
PSO 3	Demonstrate to provide professional solutions at risk situations
PSO 4	Design and analyze the insurance schemes based on the public interest and the regulation of the insurance industry

PG DEPARTMENT OF ACTUARIAL SCIENCE

B.Sc., Actuarial Mathematical Science

(For the students admitted in the Academic Year 2020-21 onwards)

Sem.	Part	Course	Course Title	Course Code	Hrs / Week	Cr	Marks		
							CIA	ESE	Total
I	I	Language -I	Tamil I /Hindi I/ Sanskrit I /French I	U18TM1L1/ U18HD1L1/ U21SK1L1/ U21FR1L1	6	3	25	75	100
	II	English I	Language through literature: Prose and Short Stories	U21EGNL1	6	3	40	60	100
	III	Core I	Introduction to Actuarial Mathematics	U20AS101	5	4	25	75	100
		Core II	Differential & Integral Calculus	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)	U15VL1:1/ U15VL1:2	2	2	25	75	100
				Total Credits:		22			
II	I	Language - II	Tamil II /Hindi II/ Sanskrit II/French II	U18TM2L2/ U18HD2L2/ U21SK2L2/ U21FR2L2	6	3	25	75	100
	II	English II	Language through literature: Poetry and Shakespeare	U21ENGL2	6	3	40	60	100
	III	Core III	Mathematics of Finance – I	U20AS203	6	5	25	75	100
		Core IV	Principles of Insurance	U20AS204	6	5	25	75	100

		Allied II	Probability Theory & Discrete Distribution	U20AS2Y2	6	4	25	75	100
				Total Credits:		20			
III	I	Language - III	Tamil III /Hindi III/ Sanskrit III/French III	U18TM3L3/ U18HD3L3/ U21SK3L3/ U21FR3L3	6	3	25	75	100
	II	English III	English for Competitive Examinations	U21EGNL3	6	3	40	60	100
	III	Core V	Mathematics of Finance – II	U20AS305	5	4	25	75	100
		Elective I	Business Economics	U20AS3:1	5	4	25	75	100
		Allied III	Continuous Distributions & Estimation Theory	U19AS3Y3	4	4	25	75	100
		Allied IV	Programming Using R	U20ASPY4	2	2	40	60	100
	IV	NMEC I	Students have to opt from other major / Introduction to Insurance	U19AS3E1	2	2	25	75	100
				Total Credits:		22			
IV	I	Language – IV	Tamil IV /Hindi IV/ Sanskrit IV /French IV	U18TM4L4/ U18HD4L4/ U21SK4L4/ U21FR4L4	5	3	25	75	100
	II	English IV	Language through Literature	U21EGNL4	5	3	40	60	100
	III	Core VI	Life and Health Contingencies - I	U20AS406	5	4	25	75	100
		Allied V	Sampling Theory & its Applications	U20AS4Y5	5	4	25	75	100

		Allied VI	Insurance Underwriting	U20AS4Y6	4	4	25	75	100
	IV	SBEC I	Stat Lab - Statistical Software	U20ASPS1	2	2	40	60	100
		NMEC II	Students have to opt from other major / Financial Markets in India	U19AS4E2	2	2	25	75	100
		Soft Skills	Life Skills	U16LFS41	2	1	--	--	100
	V	Extension Activities	NSS, NCC, Rotaract club, LEO club, etc.	U16ETA41	--	1	--	--	--
				Total Credits:		24			
		Core VII	Stochastic process	U20AS507	6	5	25	75	100
		Core VIII	Mathematical Modelling	U19AS508	6	5	25	75	100
V	III	Core IX	Life and Health Contingencies – II	U20AS509	6	5	25	75	100
		Elective II	Data Analysis using MS – Excel	U21AS5:P	5	4	40	60	100
		Elective III	Basic Accounting Concepts	U20AS5:3	5	4	25	75	100
	IV	SBEC II	Actuarial Profession	U20AS5S2	2	2	25	75	100
				Total Credits:		25			
		Core X	Operations Research	U19AS610	6	5	25	75	100
		Core XI	Numerical Analysis	U20AS611	6	5	25	75	100
		Core XII	Group Insurance & Retirement benefits	U20AS612	5	5	25	75	100
VI	III	Core XIII	Reinsurance management	U20AS613	6	5	25	75	100
		Core XIV	Introduction to Time Series	U20AS614	5	4	25	75	100
		SBEC III	Mathematics for Competitive Examinations	U19AS6S3	2	2	25	75	100
	V	Gender Studies	Gender Studies	U16GST61	--	1	--	--	100

	Total Credits:	
	27	
	Total Credits: 140	

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					

PROGRAMME ARTICULATION MATRIX

S.No.	COURSE NAME	COURSE CODE	CORRELATION WITH PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES												
			PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
1.	Introduction to Actuarial Mathematics	U20AS101	H	H	M	H	H	L	L	L	-	L	M	L	L
2.	Differential & Integral Calculus	U20AS102	H	L	M	M	H	L	L	L	-	L	M	L	L
3.	Descriptive Statistics	U19AS1Y1	H	H	H	H	H	M	M	H	-	M	M	M	L
4.	Mathematics of Finance – I	U20AS203	H	H	H	H	H	M	M	H	H	M	M	M	L
5.	Principles of Insurance	U20AS204	H	L	L	L	L	L	L	L	M	M	L	L	M
6.	Probability Theory &Discrete Distribution	U20AS2Y2	H	H	H	H	H	L	L	M	-	M	L	M	L
7.	Mathematics of Finance – II	U20AS305	H	H	H	H	H	M	M	H	H	M	M	M	L
8.	Business economics	U20AS3:1	H	L	L	L	H	L	M	M	H	M	M	M	M
9.	Continuous Distributions & Estimation Theory	U19AS3Y3	H	H	H	H	H	M	L	M	-	L	M	H	L
10.	Programming Using R	U20AS3Y4	H	H	H	H	H	H	H	H	L	H	H	L	H
11.	Introduction to Insurance	U19AS3E1	H	L	L	L	L	L	L	L	M	L	L	H	M

No.	Course Name	Code													
12.	Life and health contingencies – I	U20AS406	H	H	H	H	H	H	M	H	M	H	H	M	L
13.	Sampling Theory & its Applications	U20AS4Y5	H	H	H	M	H	M	M	H	M	M	M	L	L
14	Insurance underwriting	U20AS4Y6	H	L	L	L	L	M	M	M	H	M	L	H	L
15.	Statistical Software and MS-Excel	U20ASPS1	H	H	H	H	H	H	M	H	-	H	H	M	M
16.	Financial Markets in India	U19AS4E2	H	L	L	L	L	L	L	L	M	M	M	H	M
17.	Stochastic process	U20AS507	H	M	M	M	H	M	M	M	-	M	M	M	L
18.	Mathematical Modelling	U19AS508	H	H	H	M	H	M	M	M	-	M	M	M	L
19.	Life & Health Contingencies – II	U20AS509	H	H	H	H	H	H	H	H	-	H	L	H	L
20.	Data Analysis using MS – Excel	U19AS5:2	H	H	H	H	H	H	H	H	-	H	H	H	M
21.	Basic Accounting Concepts	U20AS5:3	H	-	M	M	M	L	L	L	-	M	M	M	L
22.	Actuarial Profession	U20AS5S2	H	-	L	L	M	L	L	L	M	L	L	L	L
23.	Operations Research	U19AS610	H	M	H	M	L	L	L	M	-	H	M	M	L
24.	Numerical Methods	U20AS611	H	M	M	M	L	L	L	M	-	M	L	L	L
25.	Group Insurance & Retirement benefit	U20AS612	H	-	L	L	L	L	L	L	-	L	L	L	L
26	Reinsurance management	U20AS613	H	-	H	L	L	L	L	M	-	L	L	H	L

27.	Introduction to time series	U20AS614	H	H	M	M	H	M	M	M	-	M	H	M	L
28.	Mathematics for Competitive Examinations	U19AS6S3	M	-	-	-	-	-	-	-	H	L	L	L	L

SEMESTER – I

SEMESTER: I **CODE: U20AS101**
CREDITS:4 **HOURS/WEEK: 5**

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1. COURSE OUTCOMES
At the end of this course, the students will be able to

CO. No	Course Outcomes	Level	Unit Covered
CO1	Relate basic mathematical notations with actuarial theory	K1	I
CO2	Extend different forms of algebraic expansions	K2	II
CO3	Apply the progression models in the field of financial problems	K3	III
CO4	Apply the exponential series in the field of financial problems	K3	IV
CO5	Analyze the logarithmic series in the field of financial problems	K4	IV
CO6	Determine the real problems related to matrices	K5	V

2. A. SYLLABUS

UNIT I: Introduction to algebra **(12 Hours)**
Mathematical Notation - Greek Symbols – Convention – Proof – Expression, Equations &
Formulae – Terms & Factors - Mathematical Induction – Indices – Logarithms – Fractions –
Quadratic Equation – Simultaneous equation - Inequalities – Arithmetic & Geometric Mean
Inequalities - Π Notation – Σ notation – Convergence – Standard summations – Swapping the
order of notation – Permutation – Combination.

UNIT II: Mathematical induction to Binomial theorem **(8 Hours)**
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 **(10 Hours)**
Arithmetic Progression – Geometric Progression – Harmonic Progression

UNIT IV: Exponential and logarithmic series (10 Hours)

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: Vectors & Matrices (10 Hours)

Notations & Arithmetic – Magnitude – Scalar Product – Matrices – Matrix Multiplication – Determinants - Inverses – Eigen Vectors – Eigen Values.

B. TOPICS FOR SELF STUDY

Sl. No.	Topics	Reference
1.	Application of progression in annuity contract.	http://users.stat.ufl.edu/~rrandles/sta4183/4183lectures/chapter04/chapter04R.pdf
2.	Application of geometric sequences and series to the financial contract	https://www.projectmaths.ie/documents/modulars/4/FinancialMathsExtraQuestions.pdf
3.	Application of algebra in risk modeling	https://people.kth.se/~lindskog/papers/RMlecturenotes07B.pdf
4.	Matrix application in investment portfolio	https://faculty.washington.edu/ezivot/econ424/portfolioTheoryMatrix.pdf

C. TEXTBOOKS

1. "Introduction to Actuarial Mathematics" – ActEd Company

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

3. T. K. Manickavasagam Pillay, T. Natarajan and K. S. Ganapathy, Algebra Volume – I.

D. REFERENCE

FAC-PC PACK, Indian Institute of Actuaries

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit / Section	Course Content	Learning Outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Introduction to Algebra**		
1.1	Mathematical Notation Greek Symbols Convention Proof Expression, Equations & Formulae Terms & Factors Mathematical Induction	Recall the notations, symbols, expressions, and formula used in mathematical, statistical and actuarial work.	K1
		Relate the principle of mathematical induction to establish the validity of general result involving natural numbers	K1
1.2	Indices Logarithms Fractions Quadratic Equation Simultaneous equation Inequalities	**Match the suitable concepts of** expressions, **equations and inequalities to investigate and describe relationships to solve problems.**	K1
1.3	Arithmetic & Geometric Mean Inequalities *Π* Notation - Σ notation Convergence Standard summations Swapping the order of notation Permutation &Combination	Relate the suitable sum of a series involving finite arithmetic or geometric progressions using the formulae and able to determine when an infinite geometric series converges.	K1
		Find the differences between permutation and combination.	K1
II	**Mathematical induction to Binomial Theorem**		
2.1	Binomial Theorem for a positive integer index	Show the binomial theorem using induction method	K2
	Properties of binomial coefficients	Extend powers of binomials using the binomial theorem.	K2
2.2	General term in the binomial expansion Middle term in the binomial expansion Greatest term in the binomial expansion	Demonstrate the different set of solving procedures for Construct the problems of middle term in the binomial expansion	K2

		Binomial theorem for any index	Construct the solution for problems of general term of expansion. The problems with irrational functions. Compare the binomial coefficients for any index using Pascal triangle	
III		**Progression**		
3.1		Arithmetic Progression Geometric Progression Harmonic Progression	Apply the progression of arithmetic, geometric and harmonic.	K3
			Construct the different kinds of application problems relevant to financial field	K3
IV		**Exponential and Logarithmic Series**		
4.1		Exponential series Exponential theorem (statement only) Summation of series, Expansions and approximations	Apply exponential and logarithmic series Solve a variety of exponential and logarithmic equations	K3
4.2		Logarithmic Series Calculation of Logarithms Summation of series, Expansions, Limits and approximations	Analyze the limits of a function in the logarithmic series and to solve using approximation method.	K4
V		**Vectors and Matrices**		
5.1		Notations & Arithmetic Magnitude Scalar Product Matrices Matrix Multiplication Determinants Inverses	Extend the vectors and matrices to solve actuarial problems	K2
5.2		Eigen Vectors & Eigen Values	Evaluate the suitable method to solve actuarial problems.	K5

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	-	L	-	-	-	M	H	L	M	-	-	M
CO2	H	H	-	H	M	H	M	-	H	H	H	M	-
CO3	H	H	M	-	H	H	H	M	H	H	L	L	L
CO4	H	H	H	H	H	M	-	H	H	H	H	M	M
CO5	H	-	M	H	M	H	M	L	H	-	M	L	L
CO6	H	H	H	H	-	M	H	M	-	H	H	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2. Open Book Test.

   Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).

3. Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey

Mr. R. Anand,

Course Coordinator.

SEMESTER: I   **CODE: U20AS102**

CREDITS:4   **HOURS/WEEK: 5**

1. COURSE OUTCOMES
At the end of this course, the students will be able to

CO. No	Course Outcomes	Level	Unit Covered
CO1	Define the value of the derivative at a point algebraically using the (limit) function	K1	I
CO2	Demonstrate exponential, logarithmic, trigonometric and inverse trigonometric functions.	K2	II
CO3	Distinguish the various forms of integrals.	K4	III
CO4	Apply various properties to solve different forms of integrals.	K3	IV
CO5	Choose the techniques to solve various integral problems.	K5	IV
CO6	Solve the different forms of multiple integrals	K6	V

2. A. SYLLABUS

UNIT I: Function and limits   **(10 Hours)**
Constants and variables – Function- Classification of function- Limit of Function- Limit and value of function- Rules for finding the limit of function- Some general theorem on limits- Certain special limits. (Note: Results only, No proof and Simple Problems)

UNIT II: **Differentiation**   **(10 Hours)**
Definition- differential coefficient of X^n – Product rule- Quotient rule- Function of function rule- Logarithmic differentiation- Differentiation of implicit function. Successive Differentiation: The nth derivative – Standard results – Leibnitz formula for nth derivative of product- Maxima & Minima (One variable) (Note: Simple Problem only).

UNIT III: Partial Differentiation   **(10 Hours)**
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: Integration Techniques   **(10 Hours)**
Integration of the forms
(i) $\int [(px + q) / (ax2 + bx + c)]dx$ (ii) $\int dx /(a + bcosx)$ - (iii) $\int [(px+ q) / \int ((ax2+bx+c))]dx$

(iv) $\int [(px+ q)/ (ax2+bx+c)] dx$ - Integration by parts - 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 V: Multiple integral (10 Hours)

Double integral – Triple integral - Change of order of integration - Improper Integral – Beta and Gamma functions: Recurrence formula of Gamma function – Properties of Beta function – Relation between Beta and Gamma functions.

B. TOPICS FOR SELF STUDY

S. No.	Topics	Reference
1	Application of functions and limits in Actuarial mathematics	https://math.libretexts.org/Bookshelves/Calculus/Book%3A_Calculus_(Apex)/01%3A_Limits/1.E%3A_Applications_of_Limits_(Exercise)
2	Product and quotient rule in Actuarial mathematics	https://math.libretexts.org/Bookshelves/Calculus/Map%3A_Calculus__Early_Transcendentals_(Stewart)/03%3A_Differentiation_Rules/3.02%3A_The_Product_and_Quotient_Rules
3	Different techniques of solving integrands.	https://www.khanacademy.org/math/old-integral-calculus/integration-techniques
4	Application of multiple integrals.	https://nitkkr.ac.in/docs/5-Multiple%20Integrals%20and%20their%20Applications.pdf

C. TEXTBOOKS

1. S. Narayanan & T. K. Manickavasagam Pillay, Calculus Volume I, S. Viswanathan Pvt. Ltd., 2004.

2. S. Narayanan and T. K. Manickavasagam Pillay, Calculus Volume – II, S. Viswanathan printers and publishers private limited, Reprint 2016.

D. REFERENCE

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

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course Content	Learning outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Functions and variables**		
1.1	Constants and variables, Classification of function and Limit of Function	Find the limit of a function at a point numerically and algebraically using appropriate techniques	K1
1.2	Limit and value of function Rules for finding the limit of function Some general theorem on limits Certain special limits		
II	**Differentiation**		
2.1	Differential coefficient of x^n Product rule, Quotient rule Function of function rule, Logarithmic differentiation	Interpret the derivative of a function at a point the as the instantaneous rate of change in the quantity modelled and state its UNITs.	K2
2.2	Successive Differentiation, Leibnitz formula for nth derivative of product Maxima & Minima (One variable)	Outline the expression for the derivative of a function using the chain rule of differentiation.	K2
III	**Partial differentiation**		
3.1	Partial Differentiation Derivation of partial derivation	Examine the meaning of partial derivative and partial derivatives using Euler's Theorem	K4
3.2	Successive partial derivation Homogeneous function		
3.3	Euler's theorem Partial derivatives of a function of two functions		

IV	Integration techniques		
4.1	(i) Integral [(px+q) / (ax2+bx+c)] dx (ii) Integral dx / (a + b cos x) (iii) Integral [(px+q)/ (ax2+bx+c))] dx (iii) Integral [(px+q)/ (Sqrt (ax2+bx+c))] dx (v) Integration by parts	Apply different sets of solving procedures for algebraic functions and understand the difference between the definite and indefinite cases and their corresponding properties	K3
4.2	Definite Integral, Properties of definite integral, Concept of Reduction formula for integral $\sin^n x$ dx, $\cos^n x$ dx, $\tan^n x$ dx	Evaluate the suitable method to solve various integral problems	K5
V	Multiple integral function		
5.1	Double integral Triple integral Change of order of integration	Disscuss the main difference between double & triple integrals and find the beta and gamma type integrands.	
5.2	Beta and Gamma Functions Recurrence formula of Gamma function Properties of Beta function		K6
5.3	Relation between Beta and Gamma functions.		

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	H	H	M	M	M	M	M	M	M	M	M
CO2	M	H	M	M	M	-	-	-	-	-	H	M	-
CO3	M	H	H	M	-	-	-	-	-	-	-	-	M
CO4	H	M	M	H	H	L	H	L	L	M	-	-	-
CO5	H	H	H	H	-	M	M	M	M	-	-	-	-
CO6	H	M	M	H	-	H	H	H	H	M	M	L	M

L - Low   **M - Moderate**   **H – High**

5. COURSE ASSESSMENT METHODS

DIRECT

1.Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2.Open Book Test.

Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).

Pre-Semester & End Semester Theory Examination

INDIRECT

1.Course end survey

Ms. H. Anitha,

Course Coordinator.

ALLIED I: DESCRIPTIVE STATISTICS

SEMESTER: I   **CODE: U19AS1Y1**
CREDITS: 4   **HOURS/WEEK: 4**

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1. COURSE OUTCOMES

At the end of the course, the students will be able to

CO. No	Course Outcomes	Level	Unit Covered
CO1	Classify different types of data set and its collection methods	K2	I
CO2	Construct data representation in different forms	K3	II
CO3	Analyze the measures of central tendencies and its dispersion	K4	III
CO4	Evaluate correlation analysis, in order to estimate the nature and the strength of the linear relationship that may exist between two variables	K5	IV
CO5	Build regression model to predict the value of one variable based on the value of the other variable	K6	V
CO6	Apply a comprehensive set of statistical tools in making practical decisions	K3	III

2. A. SYLLABUS

UNIT I: Introduction   **(8 Hours)**
Origin, growth, meaning, Definition of statistics – **Collection of Data** – Primary and Secondary data – Choice of methods – DIRECT personal observation – INDIRECT oral interview – Information through agencies - Mailed questionnaire – Selection and training of field investigators – **Classification and tabulation -** Introduction – Different types of classification – Different types of tabulation.

UNIT II: Data Presentation   **(8 Hours)**
Diagrammatic presentation Different types of diagrams (One dimensional and Two dimensional) – **Graphic presentation –** Histogram – Frequency curve – Frequency Polygon - Ogives.

UNIT III: Analysis of Data (Univariate)   **(8 Hours)**
Introduction – Measures of Central Tendency (Averages) – Arithmetic Mean – Median – Mode – Geometric Mean – Harmonic Mean – Graphical location of the partition values – Dispersion – Measure of Dispersion – Coefficient of Dispersion – Moments – Skewness – Kurtosis

UNIT IV: Analysis of Data (Bivariate)   **(8 Hours)**
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) **(8 Hours)**

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.

S No.	Topics	Reference
1	Different Methods adopted for Collecting Primary & Secondary data	https://www.statisticshowto.com/primary-data-secondary/
2	Different Methods of representing data (Diagram & Graph)	https://www.slideshare.net/VarunPremVaru/diagrammatic-and-graphical-representation-of-data
3	Correlation & its Applications	https://www.researchgate.net/publication/250184184_The_Internal_Correlation_Its_Applications_in_Statistics_and_Psychometrics
4	Regression analysis	https://smallbusiness.chron.com/application-regression-analysis-business-77200.html

B. TOPICS FOR SELF STUDY

C. TEXTBOOK

1. "Statistics**",** R. S. N. Pillai, S. Chand & Company Pvt. Ltd., ISBN: 978-81-219-0431-
2. "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.

D. REFERENCE

1. Study Material: ActEd Statistics Pack, Institute and Faculty of Actuaries (IFOA), 2018
2. John E. Freund's Mathematical Statistics with Applications, Irwin Miller Marylee's Miller, 8th Edition, Pearson Publications, ISBN: 978-93-325-1905-3

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit / Section	Course Content	Learning Outcomes	Highest Blooms taxonomic Levels of Transaction
I	**Introduction**		
1.1	Introduction: Origin, growth, meaning, Definition of statistics	1. Outline the history of Statistics. 2. Demonstrate the methods involved	K2

1.2	Collection of Data – Primary and Secondary data, Choice of methods, DIRECT personal observation, INDIRECT oral interview, Information through agencies, Mailed questionnaire	in choices between the data collection process 3. Classify the collected data based on the requirement.	K2
1.3	Classification and tabulation - Introduction Different types of classification, Different types of tabulation.		K2
II	**Data Presentation**		
2.1	Data Presentation	1. Develop the pictorial representation of the collected data.	K3
2.2	Diagrammatic presentation Different types of diagrams		
2.3	Graphical presentation**,** Histogram	2. Build the graphical view of data.	
2.4	Frequency curve: Frequency Polygon - Ogives.		K3
III	**Analysis of Data (Univariate)**		
3.1	Analysis of Data (Univariate): Introduction	1. Experiment with the collected data by means of measures of central tendency.	K4
3.2	Measures of Central Tendency (Averages)		
3.3	Arithmetic Mean, Median, Mode Geometric Mean		
3.4	Graphical location of the partition values	2. Analyze the mean, median, mode of the data set.	K3
3.5	Dispersion: Measures of Dispersion		
3.6	Coefficient of Dispersion: Moments, Skewness, Kurtosis		
IV	**Analysis of Data (Bivariate)**		
4.1	Analysis of Data (Bivariate): Introduction, Meaning of Correlation	1. Evaluate the bivariate analysis to examine the relationship between the variables	K5
4.2	Scatter Diagram		
4.3	Karl Pearson's Correlation Coefficient		
4.4	Rank Correlation Spearman's Rank Correlation Problems.		
V	**Analysis of Data (Fitting of Mathematical Models)**		
5.1	Analysis of Data (Fitting of Mathematical Models): Introduction	1. Solve the data set to predict the future by means of regression analysis.	K6
5.2	Lines of regression, Regression Coefficients		
5.3	Properties of Regression Coefficients, Angle between Two lines of Regression	2. Estimate the standard error in prediction.	K6

| 5.4 | Standard Error of Estimate, Correlation coefficient between observed and estimated values. | | |

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	M	H	L	-	H	L	-	-	L	L	L	L
CO2	H	M	H	-	-	H	L	-	-	-	-	-	-
CO3	H	H	H	H	L	H	M	L	L	L	H	H	L
CO4	H	L	H	-	L	H	L	H	L	L	L	L	H
CO5	H	L	H	L	L	H	L	-	H	H	L	H	-
CO6	H	L	H	M	M	H	H	H	H	H	H	H	H

L - Low   M - Moderate   H - High

5. COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2. Open Book Test.

3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).

4. Pre-Semester & End Semester Theory Examination

INDIRECT

1.Course end survey

Mr. K. Kapil Raj,

Course Coordinator.

SEMESTER – II

CORE III-MATHEMATICS OF FINANCE - I

SEMESTER: II   **CODE: U20AS203**
CREDITS:5   **HOURS/WEEK: 6**

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1. COURSE OUTCOMES
At the end of this course the students will be able to

CO. No	Course Outcomes	Level	Unit Covered
CO1	Classify the financial terms of bonds and shares	K2	I
CO2	Identify the cash-flow process in financial transactions.	K3	II
CO3	Identify the different types of interest rates	K3	III
CO4	Analyze the real and money rate of interest and its applications	K4	IV
CO5	Evaluate the present value of cash flow using interest rates	K5	V
CO6	Solve the accumulated value of cash flow using interest rates.	K6	V

2. A. SYLLABUS
UNIT I: Investments   **(12 Hours)**
Characteristics of Fixed interest Govt. bonds – Index linked Govt. bonds- Govt. bills – Ordinary
Shares – Property – Certificate of deposit.

UNIT II: Cash flow Model   **(12 Hours)**
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 III: Interest rates   (**12 Hours**)
 Simple Interest- Compound Interest-Simple Discount- Compound discount rate -nominal rate of
interest - nominal rate of discount - force of interest rate and relationships between effective,
nominal and force of interest rates.

UNIT IV: Real and money interest rates   **(12 Hours)**
Introduction - Definition of real and money interest rates - Deflationary conditions - Usefulness of
real and money interest rates.

UNIT V: Discounting and accumulating   (**12 Hours**)
Present value of cash flows – accumulate Value of cash flows - Interest income.

TOPICS FOR SELF STUDY

S. No.	Topics	Reference
1	New method of adopting cash flow management process	https://www.thebalancesmb.com/cash-flow-management-2947138
2	Alternative method of finding the price of financial contract.	https://www.economicsdiscussion.net/price/4-types-of-pricing-methods-explained/3841
3	Alternative method of finding the rate of return in financial contract	https://www.researchgate.net/post/What-are-the-alternative-ways-to-find-out-IRR-Internal-Rate-of-Return-except-trial-and-error-method
4	Estimate the future inflation rate.	https://www.advisorkhoj.com/tools-and-calculators/future-value-inflation-calculator

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

D. REFERENCES
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

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course Content	Learning outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Cash flow Model**		
1.1	Cash Flow Process Examples of Cash flow Scenarios Zero Coupon Bond Fixed Interest Securities	Demonstrate the Structure of Cash Flow with different scenarios and Different types of cash flow models.	
1.2	Index Linked Securities, Cash on Deposit Equity Annuity An Interest Only Loan Repayment Loan.		**K2**

II	The Time Value of Money		
2.1	Simple Interest Compound Interest Simple Discount Interest Rates	Construct Simple Interest, Compound Interest Cash flows consistency	K3
2.2	Accumulation Factors Principles of Consistency		
III	Discounting and accumulating		
3.1	Discounting and accumulating: Present Values	Apply the Present values And Accumulation Values	K3
3.2	Accumulated values The basic compound interest functions.		
IV	Level Annuities		
4.1	Level Annuities: Present Values Payments Made in Arrear	Explain about Annuities and different payment methods and perpetuities	K2
4.2	Payment Made in Advance Perpetuities.		
V	Investments		
5.1	Characteristics of Fixed interest Govt. bonds and Index linked bonds Government Bills	Apply the different types of investments with different terms and equity and govt. Bills	K3
5.2	Ordinary Shares Property Certificate of deposit		

4. Mapping Scheme for the PO, PSOs and COs:

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	-	-	M	L	H	-	M	H	M	M	M
CO2	H	H	M	L	M	M	L	-	-	M	-	M	L
CO3	M	M	-	M	H		M	-	-	-	L	L	M
CO4	M	-	-	L	M	M	H	M	M	-	M	M	M
CO5	M	M	-	-	H	H	M	M	L	-	H	H	H

CO6	-	-	lL	M	M	-	-	-	M	H	H	M	H

L- Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2. Open Book Test.

Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).

3. Pre-Semester & End Semester Theory Examination

INDIRECT

1.Course end survey

Ms. H. Anitha,

Course Coordinator.

CORE IV: PRINCIPLES OF INSURANCE

SEMESTER: II   **CODE: U20AS204**

CREDITS: 5   **HOURS/WEEK: 6**

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1. COURSE OUTCOMES

At the end of this course, the students will be able to

CO. No	Course Outcomes	Level	Unit Covered
CO1	Classify the various types of risks faced by the insurance industry and solving them using appropriate risk management tools	K2	I
CO2	Understand the basic knowledge of insurance and its different types	K2	II
CO3	Identify the functions of insurance company, role of regulatory body for the insurance industry, role of insurance in economic development	K3	II
CO4	Estimation of future exposure in insurance industry, calibration of general insurance and analyze how the insurance market function in current scenario.	K5	III
CO5	Categorize the different risk arises in general insurance products and covering the financial losses	K4	IV
CO6	Discuss the different products offered by life insurers	K6	V

2. A. SYLLABUS

UNIT I: Risk Management   (**12 Hours**)

Meaning of risk – Types of risks – Risk analysis – Risk Management techniques –

Management of risk by individuals – Management of risk by Insurers.

UNIT II: Concept of Insurance & its Evolution   (**12 Hours**)

The basics and nature of insurance – Evolution of insurance – principles which form the foundation of insurance - how insurance operates today – different classes of insurance – importance of insurance - how insurance takes care of unexpected eventualities - role of insurance in economic development and social security - contribution of insurance to the society.

UNIT III: Insurance Business & its Market   (12 Hours)

Fixing of premiums – reinsurance and its importance for insurers - The various constituents of the insurance market – operations of insurance companies - operations of intermediaries – specialist insurance companies – insurance specialists - the role of regulators – other bodies connected with insurance.

UNIT IV: General Insurance Products   (12 Hours)

Risks faced by the owner of assets – exposure to perils – features of products covering fire and allied perils - products covering marine and transit risks - products covering financial losses due to accidents - products covering financial losses due hospitalization - products covering miscellaneous risks.

UNIT V: Life Insurance products   (12 Hours)

The risk of dying early – the risk of living too long - different products offered by life insurers - term plans - pure endowment plans - combinations of plans - traditional products - linked policies - features of annuities and group policies.

B. TOPICS FOR SELF STUDY

S.No.	Topics	Reference
1	Rating practices, premium payment regulations	http://www.fimt-ggsipu.org/study/bcom314.pdf
2	Claim procedure & management	http://www.fimt-ggsipu.org/study/bcom314.pdf
3	Survey (types, methods and functions involved)	http://www.fimt-ggsipu.org/study/bcom314.pdf
4	Assessment (types, methods and functions involved)	http://www.fimt-ggsipu.org/study/bcom314.pdf

C. TEXTBOOK

   "Principles of Insurance" – IC 01 – III

D. 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 Risk management by Hull Edition 2002 Jr., C. Arthur C Williams, Peter C Young, Michael

4. L. Smith, "Risk Management & Insurance".

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course Content	Learning outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Risk management**		
1.1	Meaning of risk Types of risks Risk analysis Risk management techniques Management of risk by individuals Management of risk by Insurers	Outline the concept of risk and its types	K2
II	**Concept of Insurance & its Evolution**		
2.1	The basics and nature of insurance Evolution of insurance Principles which form the foundation of insurance How insurance operates today Different classes of insurance Importance of insurance How insurance takes care of unexpected eventualities Role of insurance in economic development and social security Contribution of insurance to the society	Identify the Indian insurance market and regulatory bodies	K3
III	**Insurance Business & its Market**		
3.1	Fixing of premiums Reinsurance and its importance for insurers The various constituents of the insurance market Operations of insurance companies Operations of intermediaries Specialist insurance companies Insurance specialists The role of regulators Other bodies connected with insurance.	Function of reinsurance and its operations	K4
IV	**General Insurance Products**		

4.1	Risks faced by the owner of assets Exposure to perils Features of products covering fire and allied perils Products covering marine and transit risks Products covering financial losses due to accidents Products covering financial losses due hospitalization Products covering miscellaneous risks	Apply the concept of fire and marine products and the products covering financial losses due to various risks	K3
V	**Life Insurance products**		
5.1	The risk of dying early The risk of living too long Different products offered by life insurers Term plans Pure endowment plans Combinations of plans Traditional products Linked policies Features of annuities and group policies	Examine the different products offered by life insurers	K3/K4

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	H	H	M	M	M	M	M	M	M	M	M
CO2	M	H	M	M	M	-	-	-	-	-	H	M	-
CO3	M	H	H	M	-	-	-	-	-	-	-	-	M
CO4	H	M	M	H	H	L	H	L	L	M	-	-	-
CO5	H	H	H	H	-	M	M	M	M	-	-	-	-

CO6	H	M	M	H	-	H	H	H	H	M	M	L	M

L - Low   **M - Moderate**   **H – High**

5. COURSE ASSESSMENT METHODS

DIRECT

1.Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2. Open Book Test.

Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).

3.Pre-Semester & End Semester Theory Examination

INDIRECT

1.Course end survey

Ms. R. Salai Jeevarathiram,

Course Coordinator.

ALLIED II - PROBABILITY THEORY AND DISCRETE DISTRIBUTION

SEMESTER: II
CREDITS: 4
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CODE: U20AS2Y2
HOURS/WEEK: 6

1. COURSE OUTCOMES
At the end of the course, the students will be able to

CO. No	Course Outcomes	Level	Unit Covered
CO1	Understand the basic terminology of probability and its applications	K2 & K3	I
CO2	Analyse the random variable and its distribution functions	K4	II
CO3	Evaluate expectations of random variable	K5	III
CO4	Application of discrete distributions	K3	IV
CO5	Application of discrete distributions	K3	V
CO6	Solve the properties of discrete distribution in different situation	K6	V

2. A. SYLLABUS
UNIT I: Theory of Probability (10 Hours)

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 (10 Hours)

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 (10 Hours)

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 (10 Hours)

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: **(10 Hours)**
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.

B. TOPICS FOR SELF STUDY

S No.	Topics	Reference
1	Probability	https://youtu.be/VoOPzXPYzBo
2	Probability and its distribution	https://youtu.be/1WONKtD2-Yw
3	Joint distribution	https://youtu.be/3bvlrplmOMg
4	Conditional Expectations	https://youtu.be/7On58EASoRw

C. TEXTBOOK

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.

D. REFERENCES

1) "ActEd Study Material: Subject – CT3"

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

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/Section	Course Content	Learning Outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Introduction to Probability Theory**		
1.1	Introduction to Probability theory Short History Basic Terminology Mathematical Probability Statistical Probability Subjective Probability Mathematical Tools 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	Illustrate the theory of probability Apply the different approaches to the theory of probability like the classical/ mathematical probability, empirical probability and axiomatic probability, along with their limitations.	K2& K3
II	**Random Variables**		

2.1	**Random Variables & Distribution functions:** Introduction to random variables Distribution functions (Both Discrete and Continuous) **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.	Examine the concept of a random variable and its probability distribution	K4

III	**Expectations of Random Variable**		
3.1	**Mathematical Expectation:** Introduction to Expectation of random variable Expected value of function of a random variable Properties of Expectation (Addition theorem and Multiplication theorem), Properties of Variance, Covariance. **Generating function:** Moment generating function,Cumulants – Properties of Cumulants.	Determine the expected value and variance of a random variable	K5
IV	**Discrete Probability Distributions**		

4.1	**Bernoulli Distribution, Binomial Distributions 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.	Apply the concept of a discrete probability distribution to a variety of problems in various diversified fields (Bernoulli, Binomial and Poisson)	K3
V	**Discrete Probability Distributions**		
5.1	**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.	Experiment with the concept of a discrete probability distribution	K3
		Estimate probability distributions to variety of problems in various diversified fields (Negative binomial, geometric and Hyper geometric distributions)	K6

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	L	H	H	H	M	-	H	H	H	M	M	M
CO2	M	M	H	H	H	M	M	H	M	M	H	M	M

CO3	M	L	M	M	M	M	M	M	M	M	M	-	L
CO4	M	L	M	-	M	L	M	M	M	L	L	M	M
CO5	H	H	H	H	H	H	H	H	H	H	H	H	H
CO6	H	H	H	H	H	H	H	H	H	H	H	H	H

<div align="center">

L - Low   **M - Moderate**   **H - High**

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5. COURSE ASSESSMENT METHODS

DIRECT

1.Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2. Open Book Test.

 Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).

3.Pre-Semester & End Semester Theory Examination

INDIRECT

1.Course end survey

Mr. Y. Franklin Gnanaiah,

Course Coordinator.

CORE V: MATHEMATICS OF FINANCE – II

SEMESTER: III   **CODE: U20AS305**
CREDITS:5   **HOURS/WEEK: 5**

1. COURSE OUTCOMES
At the end of this course the students will be able to

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Understand the different types of annuity contracts	K2	I
CO2	Solve the varying cash flow model by increasing and decreasing	K3	II
CO3	Examine the unknown parameters by using equations of value method	K4	III
CO4	Evaluate the loan outstanding by using different methods	K5	IV
CO5	Construct the loan schedule	K6	IV
CO6	Evaluation of interest rates	K5	V

2. A. SYLLABUS
UNIT I: Level Annuities   (**10 Hours**)
Present Values and accumulation values of Payments Made in Arrear, Payment Made in Advance – Perpetuities.

UNIT II: Deferred and increasing annuities   (**10 Hours**)
Introduction - Deferred annuities - Annual payments (arrear and Advance) - Increasing annuities- Annual payments (arrear and Advance) - Decreasing payments.

UNIT III: Equations of value   (**10 Hours**)
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 IV: Loan Schedules   (**10 Hours**)
Introduction-An example- Calculating the capital outstanding – Introduction-The theory - Prospective loan calculation -Retrospective loan calculation.

UNIT V: Calculating the interest and capital elements of the Loan schedule   (**10 Hours**)
- Single payment – Series of payments – Forming the loan schedule - Consumer credit: flat rates and Annual Percentage Rate.

B. TOPICS FOR SELF STUDY

S. No.	Topics	Reference
1	New method adopting the pension plans.	https://www.tflguide.com/new-pension-scheme/
2	Best method of estimate the insurance premium rate.	https://search.visymo.com/ws?q=best%20rate%20insurance&asid=vis_in_ba_gc1_5&de=c&&ac=1808&cid=326742021&aid=1329310228623695&kid=kwd-83082012367384:loc-90&locale=en_IN&msclkid=c427329c6e121dc1453a6d216df77edd
3	Alternative approach to find the outstanding loan capital.	https://www.double-entry-bookkeeping.com/other-long-term-debt/outstanding-loan-balance/
4	New method of finding the annuity contract.	ttps://www.izito.ws/ws?q=finding%20annuity&asid=iz_ws_ba_8_gc1_04&de=c&ac=5789&cid=316279484&aid=1362295153098013&kid=kwd-85143

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

D. REFERENCES
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

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course Content	Learning outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Level annuities**		
1.1	Present values and accumulation values of payments made in arrear and in advance	Interpret Level annuities	K2
1.2	Perpetuities		

II	Deferred and increasing annuities		
2.1	Introduction Deferred annuities Annual payments (arrear and Advance)	Solve Deferred annuities and Increasing annuities	K3
2.2	Increasing annuities Annual payments (arrear and Advance) Decreasing payments		
III	**Equations of value**		
3.1	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)	Discover the value for an unknown quantity	K4
3.2	Solving for the timing of a payment (n) Solving for the interest rate (i)		
IV	**Loan schedules**		
4.1	Introduction An example Calculating the capital outstanding Introduction The theory Prospective loan calculation Retrospective loan calculation	Solve the problems on Loan schedules, Prospective loan calculation	K6
V	**Flat rate**		
5.1	Calculating the interest and capital elements of the Loan schedule: single payment series of payments Forming the loan schedule	Determine the unknown value for the problems on Series of payments Consumer credit	K5
5.2	Consumer credit:		

	flat rates and Annual Percentage Rate												

4. Mapping Scheme for the PO, PSOS & COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	H	-	M	L	H	-	M	H	M	M	M
CO2	H	H	H	L	M	M	L	-	-	M	-	M	M
CO3	M	L	-	H	H	-	M	-	-	-	L	L	L
CO4	M	-	-	L	M	H	H	M	L	-	M	M	H
CO5	M	M	-	-	M	H	L	M	L	H	H	H	M
CO6	-	-	L	L	M	-	-	-	M	H	H	M	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT
1.Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2.Open Book Test.
Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project
Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
3.Pre-Semester & End Semester Theory Examination

INDIRECT
1.Course end survey

Mrs. S. Babylatha,
Course Coordinator.

SEMESTER: III   **CODE: U20AS3:1**

CREDITS: 4   **HOURS/WEEK: 5**

1. COURSE OUTCOMES

At the end of this course, the students will be able to

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Demonstrate the core economic concepts	K2	I
CO2	Application of economic concepts in business	K3	II
CO3	Distinguish between demand and supply	K4	III
CO4	Discuss the types of cost and revenue	K6	IV
CO5	Evaluate the different types of market structure	K5	IV
CO6	Importance of Macro economics	K5	V

2. A. SYLLABUS

UNIT I: Definition and Scope of Economics   **(8 Hours)**

Definitions of Economics – Differences between Micro and Macro Economics – Basic Economic Problems – Economic Systems.

UNIT II: Definition of Business Economics   **(10 Hours)**

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   **(10 Hours)**

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   **(10 Hours)**

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   **(10 Hours)**

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.

B. TOPICS FOR SELF STUDY

Sl.No.	Topics	Reference
1	History of Economic Systems	https://youtu.be/k62eauSYchE
2	Equilibrium Price & Output	www.investopeia.com
3	Marginal Utility & Indifference Curve Analysis	www.economicshelp.org www.economics.utoronto.ca
4	Game Theory	https://plato.stanford.edu/entries/game-theory/

C. TEXTBOOK
 "Business Economics"- S. Sankaran.

D. 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 Economic Theory
5. K.K. Dewett (2005), Modern Economic Theory.

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/Sec tion	Course Contents	Learning Outcomes	Highest Blooms taxonomic Levels of Transactio n
I	**Definition and Scope of Economics**		
1.1	Definitions of Economics Differences between Micro and Macro Economics Basic Economic Problems	Outline the basic concepts of economics	K2

	Economics Problems		
II	**Definition and Scope of Economics**		
2.1	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	Identify the different concepts in the field of business	K3
III	**Liability Analysis of Demand and Supply**		
3.1	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 and their types Factors Influencing Elasticity of Demand and their importance Indifference Curve Analysis Consumer Surplus.	Distinguish the human wants in terms of utility, demand & supply	K4
IV	**Cost, Revenue and Market Structure**		
4.1	Definition of Cost Fixed and Variable Costs Total cost, Average Cost and Marginal Cost Revenue: Average Revenue, Marginal Revenue and 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.	Discuss the different types of costs and revenue Assess the basic structures of market, pricing strategies	K5/K6
V	**Macro Economics**		
5.1	Objectives Definition of National Income	Importance of Macroeconomics.	K5

Determination Difficulties in Estimation Economic Growth and Development Business Cycles Unemployment Inflation Fiscal and Monetary Policies Foreign Trade Merits and Demerits Globalization Disequilibrium Correcting Measures IMF and IBRD: their objectives and functions Money and its Functions.	

C. TEXTBOOK

"Business Economics"-S. Sankaran .

D. 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.

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	H	-	-	-	H	-	-	H	H	H	H
CO2	H	M	-	-	-	-	L	L	-	L	H	H	H
CO3	H	-	H	L	L	-	L	M	-	-	-	H	H
CO4	H	L	-	-	-	H	L	M	-	L	L	H	H
CO5	H	M	L	M	-	L	M	M	L	M	H	H	H
CO6	H	M	L	M	M	L	M	M	L	M	-	H	H

L-Low   **M-Moderate**   **H- High**

5. COURSE ASSESSMENT METHODS

DIRECT
1.Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2.Open Book Test.
Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project
Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
Pre-Semester & End Semester Theory Examination

INDIRECT
1.Course end survey

Mr. J.A.S.Surendran,

Course Coordinator.

ALLIED III: CONTINUOUS DISTRIBUTIONS AND ESTIMATION THEORY

SEMESTER: III   **CODE: U19AS3Y3**

CREDITS: 4   **HOURS/WEEK: 4**

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1. COURSE OUTCOMES
At the end of this course, the students will be able to

CO.No.	Course Outcomes	Level	Unit Covered
CO1	Application of continuous distribution	K3	I
CO2	Analyze the types of continuous distribution	K4	II
CO3	Analyze the moment generating functions for continuous distribution	K4	III
CO4	Explain the Central limit theorem and its applications	K4	III
CO5	Estimate the parameters using different methods	K5	IV
CO6	Estimate the confidence interval	K6	V

2. A. SYLLABUS
UNIT I – Continuous Probability Distribution   (10 Hours)
 Normal distribution – Uniform distribution – Gamma Distribution.

UNIT II – Continuous Probability Distribution   (8 Hours)
 Beta distribution – Exponential distribution – Weibull Distribution -Logistic distribution.

UNIT III – Continuous Probability Distribution   (6 Hours)
 Cauchy distribution – Central limit theorem.

UNIT IV - Point Estimation   (8 Hours)
  Introduction – Methods of moments – one parameter case – two parameter case – MLE – one parameter.

UNIT V - Confidence Intervals   (8 Hours)
 Introduction - Confidence Intervals in General - Confidence Intervals for Normal Distribution – Variance.

B. TOPICS FOR SELF STUDY

Sl.No.	Topics	Reference
1	Applications of Characterizations in the Area of Goodness of Fit	https://link.springer.com/book/10.1007/978-94-010-1845-6
2	A New Statistic for Testing an Assumed Distribution	https://link.springer.com/book/10.1007/978-94-010-1845-6
3	Application of Statistical Models to Engineering Problems	https://link.springer.com/book/10.1007/978-94-010-1845-6
4	Extreme Order Statistics in Large Samples from Exponential Type Distributions and their Application to Fire Loss	https://link.springer.com/book/10.1007/978-94-010-1845-6

C. TEXTBOOKS

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.
2. "ActEd Study Material: Subject –CT3"

D. REFERENCE

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

3. SPECIFIC LEARNING OUTCOMES(SLO)

UNIT/ Section	Course Content	Learning outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Continuous Probability Distribution**		
1.1	Normal distribution	Utilize the properties of a normal curve and understand the relation between a normal random variable and a standard normal random variable	K3
	Uniform distribution - Gamma distribution	Solve the p.d.f. of a continuous distribution	K3

1.2		Solve the key properties of the distributions such as moments, m.g.f. and c.g.f.	K3
II	**Continuous Probability Distribution**		
2.1	Beta distribution Exponential distribution Weibull distribution Logistic distribution	Classify the Properties of Beta, Exponential, Weibull& Logistics distributions with their corresponding moments.	K4
		Inference the results of various moments of different continuous distributions.	K4
III	**Continuous Probability Distribution**		
3.1	Cauchy distribution	Analyze the characteristics of Cauchy Distribution	K4
3.2	Central limit theorem	Examine the significance of Central limit theorem.	K4
IV	**Point Estimation**		
4.1	Introduction Methods of moments One parameter case Two parameter case	Estimate the value using method of moments and able to solve the problems of one parameter and two parameter case	K5
	MLE – one parameter	Estimate the value using maximum likelihood estimate for one parameter case.	K5
V	**Confidence Intervals**		
5.1	Introduction - Confidence Intervals in General - Confidence Intervals for Normal Distribution – Variance	Build the statistical analysis using the confidence interval for normal distribution	K6

4.Mapping Scheme for the COs, POs AND PSOs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	H	L	-	H	H	H	H	-	L	L	-
CO2	H	M	M	-	H	H	-	M	H	L	L	L	-
CO3	H	-	H	M	H	H	H	-	H	H	-	H	H
CO4	H	H	H	M	-	H	H	H	H	-	H	H	H
CO5	H	H	-	M	H	M	H	H	-	H	H	-	H
CO6	H	H	H	M	H	-	H	H	H	H	H	H	H

L -Low   **M - Moderate**   **H - High**

5. COURSE ASSESSMENT METHODS

DIRECT

1.Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book

2.Open Book Test.

Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project

Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).

Pre-Semester & End Semester Theory Examination

INDIRECT

1.Course end survey

Mr. Y. Franklin Gnanaiah,

Course Coordinator.

ALLIED IV: PROGRAMMING USING R

SEMESTER: III **CODE: U20ASPY4**
CREDITS: 2 **HOURS/WEEK: 2**

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1. COURSE OUTCOMES

At the end of this course, the students will be able to,

CO. No	Course Outcomes	Level	Unit Covered
CO1	Demonstrate to access the R Console & R Studio for Analysis	K2	I
CO2	nstrate the different data types in R	K2	II
CO3	Experiment with different types of data structures	K3	III
CO4	Analyze the data using different graphical representation	K4	IV
CO5	Measure the strength of relationship between two variables	K5	V
CO6	Build regression model to predict the value of one variable based on the value of the other variable	K6	V

2. A. SYLLABUS

UNIT I: Introduction **(12 Hours)**
Downloading and installing R – Starting R – Entering commands – Exiting from R - Getting help on a function - Getting help on a package – Searching web for a help – Finding relevant functions and packages - Some Basics – Printing something – Setting variables – Listing variables - Deleting Variables - Creating a Vector - Computing Basic Statistics - Creating Sequences - Comparing Vectors - Selecting Vector Elements - Performing Vector Arithmetic

UNIT II: **Navigating the Software** **(12 Hours)**
Getting and Setting the Working DIRECTory - Saving Your Workspace - Viewing Your Command History - Input and Output - Reading Fixed-Width Records - Reading Tabular Data Files - Reading from CSV Files - Writing to CSV Files

UNIT III: **Data Structures** **(12 Hours)**
Appending Data to a Vector - Inserting Data into a Vector - Data Transformations **-** Splitting a Vector into Groups - Applying a Function to (Each List Element, Every Row, Every Column, Groups of Data, Groups of Rows, Parallel Vectors or Lists)

UNIT IV: Graphics **(12 Hours)**
Creating a Scatter Plot - Adding a Title and Labels - Adding a Grid - Creating a Scatter Plot of Multiple Groups - Creating a Bar Chart - Colouring a Bar Chart - Plotting a Line from x and y Points

- Changing the Type, Width, or Colour of a Line - Plotting Multiple Datasets - Adding Vertical or Horizontal Lines - Creating a Histogram

UNIT V: Linear Regression   (12 Hours)

Performing Simple Linear Regression - Understanding the Regression Summary – Correlation **–** Performing correlation analysis - Probability **-** Counting the Number of Combinations - Generating Combinations - Generating Random Numbers - Generating Reproducible Random Numbers - Generating a Random Sample - Generating Random Sequences - Randomly Permuting a Vector - Calculating Probabilities for Discrete Distributions - Calculating Probabilities for Continuous Distributions.

B. TOPICS FOR SELF STUDY

Sl. No.	Topics	Reference
1	Perform some Basic Arithmetic, Logical, Boolean, Complex Operations in R	https://youtu.be/7076ZuAwUn8
2	Work with Some inbuilt functions	https://youtu.be/7076ZuAwUn8
3	Incorporating the theoretical aspects with Graphical view by plotting in the diagrams or graphs	https://youtu.be/7076ZuAwUn8
4	Probabilities of Discrete & Continuous Distributions.	https://youtu.be/7076ZuAwUn8

TEXTBOOK

1. R Cookbook", Paul Teetor, O'Reilly Publication, ISBN: 978-0-596-80915-7
D. REFERENCE Book: Simple R – Using R for Introductory Statistics. John Verzani

D. REFERENCE

"An Introduction to R" by Deepayan Sarkar.

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit / Section	Course content	Learning Outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Introduction**		
1.1	Printing something – Setting variables – Listing variables - Deleting Variables - Creating a Vector - Computing Basic Statistics - Creating Sequences - Comparing	Explanation of accessibility of R Studio & R console window to perform various calculations using different vectors of elements.	K2

		Vectors - Selecting Vector Elements - Performing Vector Arithmetic		
II	**Navigating the Software**			
2.1	Getting and Setting the Working DIRECTory - Saving Your Workspace - Viewing Your Command History - Input and Output - Reading Fixed-Width Records - Reading Tabular Data Files - Reading from CSV Files - Writing to CSV Files	Explanation of the concept of saving workspace DIRECTory and can able to relook into the history command Can able to read & write files in to the R environment.	K2	
III	**Data Structures**			
3.1	Appending Data to a Vector - Inserting Data into a Vector - Data Transformations - Splitting a Vector into Groups - Applying a Function to (Each List Element, Every Row, Every Column, Groups of Data, Groups of Rows, Parallel Vectors or Lists)	Buid the vector by doing various data transformations like creating list, matrices etc.	K3	
IV	**Graphics**			
4.1	Creating a Scatter Plot - Adding a Title and Labels - Adding a Grid - Creating a Scatter Plot of Multiple Groups - Creating a Bar Chart - Colouring a Bar Chart - Plotting a Line from x and y Points - Changing the Type, Width, or Colour of a Line - Plotting Multiple Datasets - Adding Vertical or Horizontal Lines - Creating a Histogram	Classify the graphical view of the results obtained from the Command given in the R studio is very much easier to interpret the results. Construct different set of diagrams by doing the formatting options available like changing the height, width, color etc.	K4	
V	**Linear Regression**			
5.1	Performing Simple Linear Regression - Understanding the Regression Summary – **Correlation –** Performing correlation analysis	Build the linear relationship between the variables in R Studio.	K5	

5.2	**Probability -** Counting the Number of Combinations - Generating Combinations - Generating Random Numbers - Generating Reproducible Random Numbers - Generating a Random Sample - Generating Random Sequences - Randomly Permuting a Vector - Calculating Probabilities for Discrete Distributions - Calculating Probabilities for Continuous Distributions	Develop a model based on random number simulation.	K6

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	-	M	L	-	L	L	-	M	L	H	H	-	M
CO2	H	-	M	M	L	M	L	L	L	H	H	-	M
CO3	H	M	-	L	L	L	-	L	L	M	M	-	-
CO4	-	M	M	L	-	L	L	M	L	H	H	H	M
CO5	H	H	M	M	L	L	L	-	L	-	-	M	L
CO6	H	H	M	M	M	L	L	L	L	-	M	M	L

L-Low   M-Moderate   H- High

5.   **COURSE ASSESSMENT METHODS**

DIRECT
1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable)
3. End Semester Examination

INDIRECT
1. Course-end survey

Mr. Y. Franklin Gnanaiah,

Course Coordinator.

NMEC I: INTRODUCTION TO INSURANCE

SEMESTER: III   **CODE: U19AS3E1**
CREDITS: 2   **HOURS/WEEK: 2**

1. COURSE OUTCOMES

At the end of this course, the students will be able to,

CO. No	Course Outcomes	Level	Unit Covered
CO1	Classify the various types of risks faced by the insurance industry and solving them using appropriate risk management tools	K2	I
CO2	Understand the basic knowledge of insurance and its different types	K2	II
CO3	Understand the concepts of reinsurance	K2	III
CO4	Extend the principles of insurance	K2	IV
CO5	Analyze the Life insurance contract	K4	V
CO6	Determine the different products offered by life insurers	K5	V

2. A. SYLLABUS

UNIT I: Risk Management   **(4 Hours)**
Meaning of risk – Types of risks – Risk analysis – Risk Management techniques – Risk retention.

UNIT II: The concept of insurance and its evolution   **(4 Hours)**
Concept of insurance – Insurance (evolved and works) – Types of insurance – Importance of insurance industry.

UNIT III: The Business of Insurance   **(4 Hours)**
How risk is managed by individuals and insurers – premium – importance of reinsurance- role of insurance in economic development and society.

UNIT IV: The insurance contract   **(4 Hours)**
Introduction – Insurable interest – Principle of indemnity – Subrogation and contribution – Utmost good faith- Proximate cause.

UNIT V: Life insurance products   **(4 Hours)**
Traditional products – Linked products – Annuities and group policies.

B. TOPICS FOR SELF STUDY

Sl. No.	Topics	Reference
1	Reinsurance 1/1 renewals pricing trends	https://www.spglobal.com/ratings/en/events/hosted-events/2020-insurance-hot-topics
2	AI & Automation for Faster Claims	https://www.wns.com/insights/articles/articledetail/590/top-5-trends-in-the-insurance-industry
3	Tropical Cyclones Moving Slower Over Land: Study	https://www.insurancejournal.com/topics/catastrophe/
4	Insurance Sector Struggles to Innovate	https://www.insurancejournal.com/topics/insurers/

C. TEXTBOOK
"Principles of Insurance" – IC 01 - III

D. 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.

3. SPECIFIC LEARNING OUTCOMES(SLO)

U/Section	Course Contents	Learning Outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Risk Management**		
1.1	Meaning of risk Types of risks Risk analysis Risk Management techniques Risk retention	Outline the concept of risk and it's different types.	K2
II	**The concept of insurance and its evolution**		
2.1	Concept of insurance Insurance (evolved and works) Types of insurance Importance of insurance industry.	Illustrate different types of insurance and then how it works.	K2
III	**The Business of Insurance**		
3.1	The Business of Insurance: how risk is managed by individuals and insurers Premium Importance of reinsurance Role of insurance in economic and social development.	Summarize the insurance and reinsurance works	K2
IV	**The insurance contract**		
4.1	Introduction Insurable interest Principle of indemnity Subrogation and contribution Utmost good faith Proximate cause.	Outline the different features of insurance contract. .	K2
V	**Life insurance products**		
5.1	Traditional products Linked products Annuities and group policies.	Distinguish between the traditional & ULIP products to determine the importance of insurance	K4 & K5

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3
CO1	H	M	H	-	-	-	H	-	-	H	H	H
CO2	H	-	-	-	-	-	L	L	-	L	H	H
CO3	H	-	H	L	L	-	L	M	-	-	-	H
CO4	H	L	-	-	-	H	L	M	-	L	L	H
CO5	H	M	L	M	-	L	M	M	L	M	H	H
CO6	H	M	L	M	M	L	M	M	L	M	-	H

L-Low   M-Moderate   H- High

5.COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I,II, Regular Attendance of the class
2. Open book test,Slip test, Assignment, Seminar, Group Discussion
3. End Semester Examination

INDIRECT
1. Course-end survey

Ms. H. Anitha,

Course Coordinator.

SEMESTER - IV

CORE VI: LIFE AND HEALTH CONTINGENCIES - I

SEMESTER: IV   **CODE: U20AS406**

CREDITS: 4   **HOURS/WEEK: 5**

1. COURSE OUTCOMES

At the end of this course, the students will be able to

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Illustrate life table functions with real life contingent problems	K2	I
CO2	Outline the concept of life assurance policies and its benefits.	K2	II
CO3	Examine the formulae for the means and variances of the present values of the payments under assurance contracts	K4	III
CO4	Outline the concept of life annuities and its benefits	K2	IV
CO5	Examine the formulae for the means and variances of the present values of the payments under annuities	K4	IV
CO6	Solving Life Assurance & annuity contract problems	K6	V

2. A. SYLLABUS

UNIT I: Life Table   **(12 Hours)**

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   **(13 Hours)**

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)

UNIT III: Life Assurance Contract (Cont...)   **(12 Hours)**

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 IV: Life Annuity Contract   **(13 Hours)**

Introduction – Whole life annuity (due and arrear)- Temporary annuity (Due and Arrear) - Deferred annuities (Due & arrear) - Continuous annuities (Concept & simple problems only)

UNIT V: Evaluating Life Assurance & Annuity Contracts   **(10 Hours)**
Evaluating Assurance benefits – Evaluating Annuity Benefits – Premium Conversion Formulae.

B. TOPICS FOR SELF STUDY

Sl. No.	Topics	Reference
1	Mortality table	https://corporatefinanceinstitute.com/resources/knowledge/other/mortality-table/
2	Life Assurance contract	https://youtu.be/FqnPEtwbE1I
3	Life Annuity contract	https://youtu.be/fhcHDygqCmI
4	Evaluating Life Assurance & Annuity Contracts	https://youtu.be/YxWq6paIeTc

C. TEXTBOOK
1. ActEd Company Book - CM1

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

3. SPECIFIC LEARNING OUTCOMES (SLO)

Unit/ Section	Course Content	Learning outcomes	Blooms Taxonomy Levels of Transaction
I	**Life Table**		
1.1	Introduction, Constructing a life table, The force of Mortality, Using the life table, UDD – CFM, Select Mortality, Constructing Select & Ultimate life tables.	Summarise the Construction of a Life Table and their functions.	K2
II	**Life Assurance Contract**		

2.1	Introduction- The sum Assured is payable not on death.	Interpret the means and variances of the present values of the payments under assurance contracts.	K2
2.2	Whole life assurance, Term Assurance, Pure endowment Assurance, Endowment Assurance, Deferred Assurance benefits	Explanation of Life Assurance Contracts.	K2
III	**Life Assurance Contract (Cont...)**		
3.1	Introduction – The sum Assured is payable immediately on death.	Test for the means and variances of the present values of the payments under assurance contracts.	K4
3.2	Whole life assurance, Term Assurance, Endowment Assurance, Other relationships.	Analyze the problems of Life Assurance Contracts.	K4
IV	**Life Annuity Contract**		
4.1	Introduction – Annuity.	Outline of Life Annuity Contracts.	K2
4.2	Whole life annuity (due and arrear), Temporary annuity (Due and Arrear), Deferred annuities (Due & arrear), Continuous annuities.	Test for the means and variances of the present values of the payments under annuity contracts.	K4
V	**Evaluating Life Assurance & Annuity Contracts**		
5.1	Evaluating, Evaluating Annuity Benefits, Premium Conversion Formulae.	Estimate the unknown parameters in problems of Life Assurance benefits and Annuity benefits.	K6

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	H	-	M	L	H	-	M	H	-	M	M
CO2	H	-	H	L	H	M	L	-	-	M	L	-	M
CO3	H	-	M	M	M	-	M	-	-	-	-	L	H
CO4	H	L	-	-	-	-	L	M	M		H	M	-
CO5	H	M	-	L	M	H	-	M	L	M	M	H	-
CO6	H	M	L	M	M	H	M	-	H	H	M	H	M

L-Low   M-Moderate   H- High

5.COURSE ASSESSMENT METHODS

 DIRECT
 1.Continuous Assessment Test I, II, Regular Attendance of the class
 2.Open book test, Slip test, Assignment, Seminar, Group Discussion
 End Semester Examination

 INDIRECT
 1. Course-end survey

 Mr. J. Leo,
 Course Coordinator.

ALLIED V : SAMPLING THEORY AND ITS APPLICATION

SEMESTER: IV   **CODE: U20AS4Y5**

CREDITS: 4   **HOURS/WEEK: 5**

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1. COURSE OUTCOMES
At the end of the course the students will able to,

CO. No	Course Outcomes	Level	Unit Covered
CO1	Classify the different types of sampling distribution	K2	I
CO2	Analyze the test of significance of large samples for different attributes.	K4	II
CO3	Inference about the parameters in the statistical analysis	K4	II
CO4	Analyze the categorical data and test the goodness of fit	K4	III
CO5	Estimate and interpret the moments in 't' distribution	K5	IV
CO6	Estimate and interpret the moments in 'F' distribution	K6	V

2. A. SYLLABUS
UNIT I: Sampling   **(10 Hours)**
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   **(14 Hours)**
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   **(10 Hours)**
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: t- distribution   **(12 Hours)**
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-Distribution   **(14 Hours)**

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 $\chi 2$. Fisher's Z distribution – MGF of Z distribution - Fisher's Z transformation - Analysis of Variance.

B. TOPICS FOR SELF STUDY

S No.	Topics	Reference
1	Sampling and Statistical Inference	https://youtu.be/eaqMBXnf4yo
2	Testing of Hypothesis	https://youtu.be/B0uYlFct5ow
3	Chi square, t- distribution	https://youtu.be/mwy92_q0tso
4	Probability sampling	https://youtu.be/03z_NOsNdII

C. TEXTBOOK

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

D. REFERENCE

1. Introduction to Mathematical Statistics by Robert V. Hogg
2. Mathematical Statistics by John.E.Freund

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course Contents	Learning Outcomes	Highest Blooms taxonomic Levels of Transaction
I	**Introduction to Sampling theory**		
1	Introduction to sampling theory (Inference and Testing of hypothesis) Types of sampling, Concepts of sampling distribution Concept on Test of significance, Hypothesis and its types, Errors in sampling. Concepts on Critical region and Level of Significance Methods of estimation, Properties of estimators	Explanation of the meaning and utility of sampling in Statistics.	K2
II	**Testing of Significance**		
	Introduction to Test of Significance of Large Samples, concept on sampling of attribute Introduction to Test for Single proportion Application – problems on test for single proportion Application – problems on test for single proportion Introduction to Test for difference proportion Application – problems on test for difference of proportion	Analyze the concepts of parameter, statistic, sampling distribution of a statistic and its standard error, and their utility in large sample test.	K4

IV	Application – problems on test for difference of proportion Theorem- Unbiased estimates for population mean and population variance Concepts on standard error of mean and simple problems Introduction to Test of significance of single mean Application – problems on test of significance of single mean Application – problems on test of significance of single mean Application – problems on test of significance for difference of mean Application – problems on test of significance of standard deviation			
III	**Chi Square distribution**			
3.1	Introduction to Chi-square distribution (Goodness of fit & Independence of attribute) Derivation - MGF of chi-square distribution CGF of chi-square distribution and simple application Derivation on Limiting form of chi-square distribution, simple application on limiting form Mode of Chi-square distribution, Problems on Mode calculation Skewness calculation on Chi-square distribution Problems on Population variance under chi-square Practice problems on Chi Square for population variance Introduction and Application - problems on test for goodness of fit Problems on test for goodness of fit Introduction and Application – problems on independence of attribute	Clasify various concepts like m.g.f., characteristic function etc., related to chi-square distribution	K4	
IV	**Small and Large Sample test**			

4.1	Introduction to "t" distribution, Detailed concepts on its application Derivation on students "t" distribution Examples on t-test for single mean Problems on t-test for single mean Examples on t-test for difference of means Problems on t-test for difference of means Practice problems on t-test	Determine student's 't', Fisher's "t", F and Z statistics and derive their probability distributions.	K5
V	**Testing of Variance**		
5.1	Introduction and Derivation of F-distribution Derivation on Constants of F-distribution Application – Problems on F- test for equality of population variance Examples on F- test for equality of population variance Problems on F- test for equality of population variance Derivation - Relationship between t and F distribution & simple application Derivation - Relation between F and χ^2 and simple application Introduction to Fisher's Z distribution, MGF of Z distribution Concept on Fisher's Z transformation, Introduction to ANOVA and application problems	Elaborate transformation and discuss its various applications in Statistics	K6

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	L	M	L	M	M	M	H	H	H	-	-	L
CO2	H	M	M	M	M	M	M	M	M	M	-	-	M
CO3	H	H	H	H	H	L	L	L	M	M	L	L	M
CO4	H	H	H	H	H	M	M	M	M	H	H	H	H
CO5	M	M	M	H	H	M	M	M	H	H	M	M	H
CO6	H	H	H	H	H	H	H	H	H	H	H	H	H

L-Low   M-Moderate   H- High

5.COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
   Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
   Pre-Semester & End Semester Theory Examination

INDIRECT
1. Course end survey

Mr. Y. Franklin Gnanaiah.

Course Coordinator.

SEMESTER: IV   **CODE: U20AS4Y6**

CREDITS: 4   **HOURS/WEEK: 4**

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1. COURSE OUTCOMES
At the end of this course the students will be able to

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Classify the risks associated with underwriting process	K2	I
CO2	Identify the life related risks and estimate the premium	K3	II
CO3	Categorize the General Insurance Risks and limits of acceptance.	K4	III
CO4	Analyze the health insurance underwriting process and its requirements.	K4	IV
CO5	Determine the need for reinsurance and its types	K5	V
CO6	Choose the appropriate reinsurance products to mitigate the risk	K6	V

2. A. SYLLABUS
UNIT-I: Introduction to Underwriting   **(8 Hours)**
What is insurance – Profile of an Underwriter – What is underwriting – Purpose & Objectives of Underwriting – Why Underwriting is important – The Underwriting Process – Functions of Underwriting – Types of Underwriters – Underwriting Decisions – Policies on Preferred / Standard / Sub-standard Basis – Monitoring Underwriting Decisions.

UNIT II: Life Underwriting - Principles & Concepts   **(8 Hours)**
Concepts of Life underwriting – Risk assessment - Mortality and morbidity –Assessing individual risks - Selection of lives - Classification of risks - Types of extra risks :Increasing, decreasing and constant extra risks - Substandard and other extra risks - Level premium - Temporary extra premium - Diminishing Lien - Exclusions - Postponement of acceptance of risk - Declinature of the acceptance of risk.

UNIT III: Methodology & Procedures of General insurance Underwriting   **(8 Hours)**
Underwriting of New Business – Scrutiny of Proposals – Limits of Acceptance – Acceptance subject to controlling office Approval – Acceptance of Extra Hazardous Risks – Underwriting Safeguards – New Business Procedure - Underwriting of Renewal Business.

UNIT IV: Health Insurance Underwriting   **(8 Hours)**
Health Insurance underwriting - What & why of health insurance underwriting –Factors impacting morbidity - Basic principles of underwriting (Uberrima fides - Insurable interest - Indemnity - Contribution clause - Proximate cause) - Documents used for underwriting - Numerical Rating method of underwriting - Advantages & Disadvantages of the Numerical Rating Method - Types of underwriting decisions taken - General Exclusions & Standard Exclusions - Group Health Insurance

UNIT V: **Reinsurance**   **(8Hours)**

Need for reinsurance - Types of reinsurance - Facultative reinsurance - Automatic reinsurance - Catastrophe reinsurance - Advantages of reinsurance arrangements - Reinsurance treaty - Underwriting Audits by reinsurers.

B. TOPICS FOR SELF STUDY

S. No.	Topics	Reference
1	Calculate the loan under writing	https://study.com/academy/lesson/loan-underwriting-definition-process-purpose.html
2	Securities under writing	https://www.wise-geek.com/what-is-securities-underwriting.htm
3	Forensic underwriting	https://definitions.uslegal.com/f/forensic-underwriting/
4	Aggregate excess of loss reinsurance model	https://www.investopedia.com/terms/a/aggregate-excess-insurance.asp

C. TEXTBOOKS

1. "Life Insurance Underwriting" – IC22
2. "Life and health insurance underwriting" - Mary C. Bickley /Barbara Foxen Berger Brown / Brown Jane Light cap

D. REFERENCES

1. Elements of Insurance by Dr E. Dharmaraj, SIMERS Publication.
2. Advanced underwriting techniques, Joseph Mangan & Harrison Connor

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course Content	Learning outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Underwriting**		
1.1	What is insurance and underwriting, profile of an underwriter, Purpose & Objectives of Underwriting. important, of the Underwriting Process, Functions of Underwriting	Explain the underwriting concept and types of underwriting and Understand the concepts	K2
1.2	Types of Underwriters and Underwriting Decision and Monitoring Underwriting decision		
II	**Risk assessment**		
2.1	Concepts of Life underwriting, Risk assessment - Mortality and morbidity –Assessing individual risks	Explain the underwriting techniques and classify different forms of underwriting risks	K2
2.2	Selection of lives, Classification of risks, Types of extra risks Increasing, decreasing and constant extra risk.		
III	**Underwriting Safeguards**		
3.1	Underwriting of New Business, Security of Proposals Limits of Acceptance, Acceptance subject to Controlling office Approval	Explain the role of surveyors in General Insurance.	K2
3.2	Acceptance of Extra Hazardous Risks Underwriting Safeguards New Business Procedure		

	Underwriting of Renewal Business.	

IV	**Health Insurance underwriting**		
4.1	Health Insurance underwriting, What & why of health insurance underwriting, Factors impacting morbidity Basic principles of underwriting, Documents used for underwriting	Explain the concept of various risk management strategies and challenges	K5
4.2	Numerical Rating method of underwriting - Advantages & Disadvantages of the Numerical Rating Method Types of underwriting decisions taken - General Exclusions & Standard Exclusions - Group Health Insurance.		

V	**Reinsurance**		
5.1	Need for reinsurance and types of reinsurance Facultative reinsurance Automatic reinsurance Catastrophe reinsurance	Apply different reinsurance treaties and Analyze the reinsurance risk in terms of their different types of sharing.	K3
5.2	Advantages of reinsurance arrangements Reinsurance treaty Underwriting Audits by reinsurers.		

4. Mapping Scheme for the PO, PSOS AND COS

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	-	M	L	H	H	H	H	H	H	L	M
CO2	H	M	L	H	M	H	L	H	M	H	H	H	H
CO3	H	M	L	M	L	H	L	L	M	L	H	H	M
CO4	H	H	-	L	M	H	H	M	H	H	H	L	L

CO5	H	L	-	-	L	H	-	L	L	L	H	M	M
CO6	H	L	-	-	L	H	L	L	L	L	H	M	M

L-Low   **M-Moderate**   **H- High**

5.COURSE ASSESSMENT METHODS

DIRECT
1.Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2.Open Book Test.
Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project
Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
Pre-Semester & End Semester Theory Examination

INDIRECT
1. Course end survey

Mr. J.A.S. Surendran,

Course Coordinator.

SEMESTER: IV   **CODE: U20ASPS1**

CREDITS: 2   **HOURS/WEEK: 2**

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1. COURSE OUTCOMES

At the end of this course, the students will be able to

CO. No	Course Outcomes	Level	Unit Covered
CO 1	Define a wide range of data management tasks in application	K1	1
CO 2	Demonstrate the basic workings of Statistical software and perform basic statistical analyses.	K2	2
CO 3	Apply database management tasks, descriptive statistics and graphics, and basic inferential statistics for comparisons and correlations.	K3	3
CO 4	Apply data checking and create simple tables and charts	K3	4
CO 5	Examine advanced analysis in Statistical software	K4	5
CO 6	Examine the integrate information and build models.	K6	5

2. A. SYLLABUS
UNIT I: Research   (**4 Hours**)

Research Design and Planning statistics and Research – Collection of Data– Preparing Questionnaire – Types of Scales – Measurement Scales – Introduction to Statistical Software – Creating Data Base using Statistical Software – Defining Variables.

UNIT II: Diagrammatic and Graphical representation   **(4 Hours)**

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   **(4 Hours)**

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

UNIT IV: Correlation Analysis   **(4 Hours)**
Scatter Diagram - Karl Pearson's Correlation Coefficient – Spearman's Rank Correlation Coefficient – Regression analysis.

UNIT V: Testing of Hypothesis   **(4 Hours)**

t- test - Paired t- test - Chi- square test - ANOVA test.

B. TOPICS FOR SELF STUDY

S.No	Topics	Reference
1	Creating Bar chart	https://statistics.laerd.com/spss-tutorials/bar-chart-using-spss-statistics.php
2	Graphical Representation	https://statistics.laerd.com/spss-tutorials/clustered-bar-chart-using-spss-statistics.php
3	Measure of central tendency	http://statistics-help-for-students.com/How_do_I_analyze_data_in_SPSS_for_central_tendency_and_dispersion.htm#.X7uwPc0zbIU
4	Correlation Analysis	https://statistics.laerd.com/spss-tutorials/pearsons-product-moment-correlation-using-spss-statistics.php

C. TEXTBOOK

Study Material – Discovering Statistics Using SPSS 2nd Edition, Andy Field, Sage Publications., 2005, ISBN: 10 7619 4451 6.

D. REFERENCE

How to Use SPSS®, A Step-By-Step Guide to Analysis and Interpretation, By Brian C. Cronk · 2017

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/Section	Course Content	Learning Outcomes	Highest Blooms taxonomic Levels of Transaction
I	**Research**		
1.1	Research Design and Planning statistics and Research	Define the research	K1
1.2	Collection of Data– Preparing Questionnaire		
1.3	Types of Scales – Measurement Scales		

1.4	Creating Data Base using Statistical Software – Defining Variables.		
II	**Diagrammatic and Graphical representation**		
2.1	Simple Bar Diagram	Demonstrate the consumer price index	K2
2.2	Multiple Bar Diagram		
2.3	Histogram – Frequency Curve – Pie chart – Stem and Leaf - Dot Plot - Box Plot.		
III	**Measures of Central Tendency**		
3.1	Arithmetic Mean- Median – Mode – Geometric Mean – Harmonic Mean-	Construct the A.M, G.M, H.M	K3
3.2	**Measures of Dispersion:** Range – Average deviation – Standard Deviation – Skewness – Kurtosis		
IV	**Correlation Analysis**		
4.1	Scatter Diagram - Karl Pearson's Correlation Coefficient – Spearman's Rank Correlation Coefficient – **Regression analysis**.	Construct and analyses the trend value by using different methods	K3
V	**Testing of Hypothesis**		
5.1	t- test - Paired t- test - Chi- square test - ANOVA test.	Analyze Different types of test to fit the data Create a database based on the objective and apply appropriate statistical tools	K4 & K6

4.Mapping Scheme for the PO, PSOs and COs

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	M	M	H	L	-	H	L	-	-	L	L	L	L
CO2	H	M	H	-	-	H	L	-	-	-	-	-	-
CO3	H	H	H	H	L	H	M	L	L	L	H	H	L
CO4	H	L	H	-	L	H	L	H	L	L	L	L	H
CO5	H	L	H	L	L	H	L	-	H	H	L	H	-
CO6	H	L	H	M	M	H	H	H	H	H	H	H	H

L-Low   M-Moderate   H- High

5.COURSE ASSESSMENT METHODS

DIRECT

1. Continuous Assessment Test: T1, T2 (Practical Components): Closed Book

2. Cooperative Learning Report, Assignment, Group Discussion, project Report, Field Visit Report, Seminar.

3. Pre/Post Test, Viva, Report for each Exercise.

4. Lab Model Examination & End Semester Practical Examination

INDIRECT
1. Course-end survey

Mr. Y. Franklin Gnanaiah,
Course Coordinator.

NMEC II - FINANCIAL MARKETS IN INDIA

SEMESTER: IV   **CODE: U19AS4E2**
CREDITS: 2   **HOURS/WEEK: 2**
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1. COURSE OUTCOMES

At the end of this course, the students will be able to

CO. No	Course Outcomes	Level	Unit Covered
CO1	Illustrate the functions of financial system	K2	I
CO2	Identify the different financial markets.	K3	II
CO3	Identify the types of financial assets in the stock market.	K3	III
CO4	Demonstrate the functions of commercial banks.	K2	IV
CO5	Demonstrate the money market intermediates.	K2	IV
CO6	Analyze the various kinds of money market instrument.	K4	V

2. A. SYLLABUS
UNIT I: Financial system   (4 Hours)

Meaning - role and functions of a financial system - Organized and Unorganized financial system - Components: Financial Assets - Financial Intermediaries.

UNIT II: Primary Markets   (4 Hours)

Meaning – Instruments - New Issue Market – Features - Objectives - functions, Constituents or players, Problems and Recent Developments including the concept of book building - Modes of procuring long term funds: Public issue, Rights issue, Bonus issue, Private placement.

UNIT III: Secondary Markets   (4 Hours)

Meaning - Functions of the stock exchange - Benefits to the commUNITy-investors - companies - Listing of securities and its benefits - Stock market indices - Types of dealings - types of securities - Traded on the Indian stock exchanges, - Comparison of the three exchanges (BSE, NSE, OTCEI)

UNIT IV: Money Markets   (4 Hours)

Meaning - features of organized instruments -Unorganized money markets Instruments - Treasury Bills, Certificate of Deposits - Commercial Paper - Call money Commercial bills - Inter-corporate deposits - Inter-bank participation certificates.

UNIT V: Money market institutions
(**4 Hours**)

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 and features).

B. TOPICS FOR SELF STUDY

Sl. No.	Topics	Reference
1.	Money Market	https://groww.in/p/money-market-instruments/
2.	Capital Market	https://indianmoney.com/articles/capital-market-instruments
3.	Stock market rules	https://www.sebi.gov.in/
4.	RBI	https://www.rbi.org.in/

C. TEXTBOOKS

1. Vasant Desai, "The Indian financial system and Development", Himalaya Publishing House. [UNIT I]
2. Dr. S. Gurusamy, "Financial Markets and Institutions", Tata McGraw Hill. [UNIT II, III & IV]
3. Dr. Bharti Pathak, The Indian Financial System, Pearson. [UNIT V]
4. "Financial Markets and Services" - Dr. L.Natarajan

D. REFERENCE

"Financial Services" – B.Santhanam

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit / Sec.	Course Content	Learning Outcomes	Highest Blooms taxonomic Levels of Transaction
I	**Financial system**		
1.1	Meaning	Demonstrate the theoretical base into practical fields.	K2
1.2	Role and functions of a financial system		
1.3	Financial Intermediate		
II	**Primary Markets**		
2.1	New Issue Market	Apply the types of financial market.	K3
2.2	Financial Instruments		
2.3	Constituents or players and problems		

III	Secondary Markets		
3.1	Meaning	Identify the type's financial assets in the stock market.	K3
3.2	Functions of Stock		
3.3	Benefits to the CommUNITy		
3.4	Listing of Securities and its benefits - Companies of BSE, NSE,OTCEI		
IV	**Money Markets**		
4.1	Meaning	Demonstrate the concept of financial market.	K2
4.2	Features of Organized and Unorganized Money Markets		
4.3	GRS instruments of money market		
V	**Money market institutions**		
5.1	Meaning	Analyze the types of financial market instruments.	K4
5.2	Role of the Central Bank (RBI) in money markets		
5.3	Money market Instruments		

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	M	H	L	-	H	L	-	-	L	L	L	L
CO2	H	M	H	-	-	H	L	-	-	-	-	-	-
CO3	H	H	H	H	L	H	M	L	L	L	H	H	L
CO4	H	L	H	-	L	H	L	H	L	L	L	L	H
CO5	H	L	H	L	L	H	L	-	H	H	L	H	-
CO6	H	L	H	M	M	H	H	H	H	H	H	H	H

L-Low   **M-Moderate**   **H- High**

5.COURSE ASSESSMENT METHODS

DIRECT

1.Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2.Open Book Test.

      Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written). Pre-Semester & End Semester Theory Examination

INDIRECT

1. Course end survey

Ms. H. Anitha,

Course Coordinator.

SEMESTER-V

SEMESTER: V   **CODE: U20AS507**
CREDITS: 5   **HOURS/WEEK:6**

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1. COURSE OUTCOMES
At the end of this course, the students will be able to

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Explain the concept of stochastic process.	K2	I
CO2	Apply the concept of Markov chain.	K3	II
CO3	Apply the concept of Basic limit theorem.	K3	III
CO4	Determine the Stationary distribution of a Markov chain.	K5	IV
CO5	Explain the pure birth process and its marginal distribution	K5	V
CO6	Discuss the concept of Continuous time Markov chains.	K6	V

2. A. SYLLABUS
UNIT I: Elements of Stochastic Processes   **(12 Hours)**

Elements of Stochastic Processes-Classification of general Stochastic Processes (definition

and examples)

UNIT II: Markov chains   **(12 Hours)**

Markov chains-Recurrent and transient rates-Periodicity-Random walk (definition and examples)

UNIT III: Basic limit theorem   **(12 Hours)**

Basic limit theorem and its applications-Irreducible Markov chain (definition and examples)

UNIT IV: Stationary distribution   **(12 Hours)**

Stationary distribution of a Markov chain- Existence of a Stationary distribution (Illustrations)

UNIT V: Continuous time Markov chains   **(12 Hours)**

Continuous time Markov chains- Poisson Process –Marginal distribution of a Poisson Process –Pure birth Process - Marginal distribution of a Pure birth Process.

B. TOPICS FOR SELF STUDY

Sl. No.	Topics	Reference
1	Stochastic process	https://youtu.be/Llf78-XbLTo
2	Markov chains	https://youtu.be/i3AkTO9HLXo
3	Continuous time Markov chains	https://youtu.be/oJ25iB6tvgc

C. TEXTBOOK
J. Medhi," Stochastic Processes", Wiley Eastern Limited, New Delhi.

D. REFERENCE
S. M. Ross," Stochastic Processes", John Wiley, New York.

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course Content	Learning outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Elements of Stochastic Processes**		
1.1	Elements of Stochastic Processes	● Demonstrate the Elements & Classification of Stochastic Processes.	K2
1.2	Classification of general Stochastic Processes		
II	**Markov chains**		
2.1	Markov chains	Experiment with Markov Process & chains.	K3
2.2	Recurrent and transient rates		
2.3	Periodicity		
2.4	Random walk		
III	**Basic limit theorem**		
3.1	Basic limit theorem and its applications	● Apply the Basic limit theorem and its applications.	K3
3.2	Irreducible Markov chain		
IV	**Stationary distribution**		

| 4.1 | Stationary distribution of a Markov chain | Evaluate the problems of Stationary distribution of a Markov chain | |
| 4.2 | Existence of a Stationary distribution | | K5 |

V	**Continuous time Markov chains**		
5.1	Continuous time Markov chains	Develop the Continuous time Markov chain process.	K6
5.2	Poisson Process		
5.3	Marginal distribution of a Poisson Process		
5.4	Pure birth Process	Deduct the marginal distribution of a pure birth process	K5
5.5	Marginal distribution of a Pure birth Process		

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	H	-	M	L	H	-	M	H	-	M	M
CO2	H	-	H	L	H	M		-	-	M	L	-	M
CO3		-	M	M	M	-	M	-	-	-	-	L	H
CO4	H	L	-	-	-	-	L	M	M		H	M	-
CO5	H	M	-	L	M	H	-	M	L	M	M	H	-
CO6	H	M	L	M	M	H	M	-	H	H	M	H	M

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).Pre-Semester & End Semester Theory Examination

INDIRECT
1. Course end survey

Mr. Y. Franklin Gnanaiah,

Course Coordinator.

CORE VIII: MATHEMATICAL MODELLING

SEMESTER: V
CREDITS:5

CODE: U19AS508
HOURS/WEEK: 6

1. COURSE OUTCOMES

At the end of this course, the students will be able to

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Applying ODE to construct the model for lifetime applications.	K3	I
CO2	Identify the relationships between mathematics and life science and to develop a model.	K3	II-III
CO3	Inspect the real-world systems from science and technology in a mathematical framework.	K4	III
CO4	Choose the best investment projects	K5	IV
CO5	Create linear predictor model	K6	V
CO6	Develop Models for short term insurance contracts	K6	V

2. A. SYLLABUS

UNIT I: Introduction to Ordinary differential equation   (12 Hours)

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   (12 Hours)

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   (12 Hours)

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   (12 Hours)

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   (12 Hours)

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

B. TOPICS FOR SELF STUDY

CO. No.	Topics	Reference
1	Introduction to Mathematical Modelling	https://ncert.nic.in/ncerts/l/iemh1a2.pdf
2	Population Dynamics	Basic Concepts in Population Modeling, Simulation, and Model-Based Drug Development (nih.gov)
3	Cash-Flow Process	CM1-IFOA
4	Risk Modelling	CS2-IFOA

C. TEXTBOOK

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

D. REFERENCES

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

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course Content	Learning outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Introduction to Ordinary differential equation**		
1.1	Linear growth model	Practice of modelling through Ordinary Differential Equation. and able to solve non – linear growth and decay models	K3
1.2	Growth of science and scientists		
1.3	Non-linear growth and decay models		
1.4	Diffusion of glucose or a medicine in the bloodstream		
II	**Modelling in population dynamics**		
2.1	Prey-predator models	Practice of modelling techniques to solve prey – predator count.	K3
2.2	Competition models		
2.3	Multi-species models		
2.4	Modelling of epidemics		
2.5	Simple epidemic models		
2.6	A model for diabetic-mellitus		

III	**Modelling through difference equations**		
3.1	Linear difference equation	Practice of modelling through Ordinary Differential Equation and Apply the modelling technique into the field of Actuarial Science.	K3
3.2	Obtaining complementary function by use of matrices		
3.3	Harrods model		
3.4	Cob-Web model		
3.5	Applications of Actuarial Science		
IV	**CashFlow Process**		
4.1	Net present value and accumulated profit	Analyse the performance of a project in the company using IRR, NPV, DPP techniques.	K4
4.2	Internal rate of return		
4.3	Payback period		
4.4	Discounted payback period		
V	**Models for short term insurance contracts**		
5.1	Collective risk model	Examines the possible ways for Actuarial applications in General insurance.	K5
5.2	Compound distribution		
5.3	Surplus process		
5.4	Linear predictor model		

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	M	H	L	-	H	L	-	-	L	L	L	L
CO2	H	M	H	-	-	H	L	-	-	-	-	-	-
CO3	H	H	H	H	L	H	M	L	L	L	H	H	L
CO4	H	L	H	-	L	H	L	H	L	L	L	L	H
CO5	H	L	H	L	L	H	L	-	H	H	L	H	-
CO6	H	L	H	M	M	H	H	H	H	H	H	H	H

L - Low   M - Moderate   H - High

5. COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2. Open Book Test.
3. Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4. Pre-Semester & End Semester Theory Examination

INDIRECT
1. Course end survey

Mr. R. Anand,

Course Coordinator.

CORE IX: LIFE AND HEALTH CONTINGENCIES – II
SEMESTER: V   **CODE: U20AS509**
CREDITS: 5   **HOURS/WEEK: 6**
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1. COURSE OUTCOMES
At the end of this course, the students will be able to

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Explain the various benefits pertaining to different types of contracts.	K2	I
CO2	Solve the Gross premium calculations using the basic assumptions.	K3	II
CO3	Classification of Reserves	K4	III
CO4	Evaluate the Reserves for conventional without profit contracts.	K5	III
CO5	Evaluate the Mortality profit of the single policy or portfolio of policies	K5	IV
CO6	Estimation of benefit payments in life insurance contracts	K6	V

2.A. SYLLABUS
UNIT I: Variable Benefits and Conventional with Profit Contract   **(12 Hours)**
Introduction – Variable Payments – Payments varying at a constant Compound interest rate – Payment varying at a constant Monetary rate – Conventional with profit contract.

UNIT II: Gross Premium   **(12 Hours)**

Introduction – The Gross Premium – Gross Future Loss random variable – Principle of Equivalence – Calculating Gross premium using simple criteria.

UNIT III: Gross Premium Reserves   **(12 Hours)**

Introduction – Why hold Reserves? – Prospective Reserves – Retrospective reserves – Equality of Prospective & Retrospective Reserves – Recursive relation between reserves – Net Premium Reserves for conventional without profit contracts.

 UNIT IV: Mortality profit   **(12 Hours)**
 Introduction - Mortality profit on a single policy - Mortality profit on a portfolio of policies

UNIT V: Mortality profit (Cont.)   **(12 Hours)**

Allowing for death benefits payable immediately - Allowing for survival benefits - Allowing for different premium or annuity payment frequencies.

B. TOPICS FOR SELF STUDY

Sl. No	Topics	Reference
1	Gross premium	https://www.moneycontrol.com/glossary/insurance/gross-premium_1252.html
2	Gross premium reserves	http://www.acted.co.uk/forums/index.php?threads/gross-premium-reserve-vs-net-premium-reserve.3598/
3	Mortality profit	https://youtu.be/po9qZWd_XI4

C. TEXTBOOK
1. ActEd Company Book – CM1

D. REFERENCE

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

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course Content	Learning outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Variable Benefits and Conventional with Profit Contract**		
1.1	Variable Payments	Relate the Variable Payments at a constant Compound interest rate and a constant monetary rate	K2
1.2	Payments varying at a constant Compound interest rate		
1.3	Payment varying at a constant monetary rate		
1.4	Conventional with profit contract.		
II	**Gross Premium**		
2.1	The Gross Premium	Solve the problems of Gross Premium.	K3
2.3	Gross Future Loss random variable		

2.4	Principle of Equivalence		
2.5	Calculating Gross premium using simple criteria.		

	III	**Gross Premium Reserves**		
3.6		Gross Premium Reserves	● Classify the policies and estimate the Gross Premium Reserve.	K4
3.6.1		Prospective Reserves		
3.6.2		Retrospective reserves		
3.6.3		Equality of Prospective & Retrospective Reserves		
3.6.4		Recursive relation between reserves for annual premium contracts	● Assess the problem and find the Prospective Reserves & Retrospective reserves.	K5

	IV	**Mortality profit**		
4.0		Introduction- Mortality profit	Evaluate the problems of Mortality profit on a single policy & Mortality profit on a portfolio of policies.	K5
4.1		Mortality profit on a single policy		
4.2		Mortality profit on a portfolio of policies		

	V	**Mortality profit (Cont.)**		
5.3		Allowing for death benefits payable immediately	Estimate the premium and benefit in different types of life insurance policies	
5.4		Allowing for survival benefits		
5.4		Allowing for different premium or annuity payment frequencies.		K6

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	M	H	-	M	L	H	-	M	H	-	M	M
CO2	H	-	H	L	H	M		-	-	M	L	-	M
CO3		-	M	M	M	-	M	-	-	-	-	L	H

CO4	H	L	-	-	-	-	L	M	M		H	M	-
CO5	H	M	-	L	M	H	-	M	L	M	M	H	-
CO6	H	M	L	M	M	H	M	-	H	H	M	H	M

L-Low   **M-Moderate**   **H- High**

5.COURSE ASSESSMENT METHODS

DIRECT
1.Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book Open Book Test.
2.Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
3.Pre-Semester & End Semester Theory Examination

INDIRECT
1. Course end survey

Mr. J. Leo,

Course Coordinator.

ELECTIVE II: DATA ANALYSIS USING MS – EXCEL

SEMESTER: V   **CODE: U21AS5:P**

CREDITS: 4   **HOURS/WEEK: 5**

1. COURSE OUTCOMES

At the end of this course, the students will be able to,

CO. No	Course Outcomes	Level	Unit Covered
CO1	Make use of the basic formatting and editing options	K3	I
CO2	Interpret the data using different Conditional formatting options in Excel	K3	II
CO3	Organize the data using pivot tables & pivot charts in MS-Excel	K3	III
CO4	Examine the values using functions library for sorting data	K4	IV
CO5	To understand the purpose of using macros function in the workbook.	K2	V
CO6	Formulate the basic macros to enhance the effective usage of excel functions in the workbook.	K6	V

2. A. SYLLABUS

UNIT I: Basic Commands & Filters Using Excel   (12 Hours)

Creating new workbooks – Saving workbooks – Selecting cells – Entering text & numbers into cells – Naming the cell – Protecting Sheets & Cells - Name manager – Insert rows & columns - Auto Complete – Drop-down list – Dependent drop – down – Multiple dependent drop - down – Using the "Window" Command group – Switching to Full screen view – Renaming workbooks – Move or copy Worksheets – Working with Excel file Formats

UNIT II: Formatting & Advanced Filtering Using Excel   (12 Hours)

An Overview of formulas layout - Find & Replace – Sort & Filter (custom sort) - Data Validation – Remove duplicates – Import Data from different resources - Text to columns – usage of Paste Special – Freeze Panes - Mail merge – Formatting Data & Conditional Formatting – Finding cells with conditional formatting – Clearing conditional formatting – Using table and cell styles - Excel Shortcuts

UNIT III: Pivot Table & Chart   (12 Hours)

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: Lookup Functions   **(12 Hours)**

Overview on the Statistical functions **-** The Horizontal lookup & Vertical lookup Functions – Using IF, AND, & OR functions – Index, Match & Offsetting Functions

UNIT V: Applications of Macros & VBA   **(12 Hours)**

Recording Macros – Running & deleting Recorded Macros – The Personal Macro Workbook – How to create 'Module' - Overview of VBA Coding & VBA objects - User Defined Functions using macro – Loops – For Each, For Next, Do While & Do Until loops – Debugging Macros.

B. TOPICS FOR SELF STUDY

Sl. No.	Topics	REFERENCE
1	Conditional Formatting	https://youtu.be/rwbho0CgEAE
2	Pivot Tables & Charts	https://youtu.be/rwbho0CgEAE
3	Lookup Functions & Formulae	https://youtu.be/rwbho0CgEAE
4	Macros & VBA	https://youtu.be/rwbho0CgEAE

C. TEXTBOOK

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

D. REFERENCE

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

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit / Section	Course content	Learning Outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Basic Commands & Filters Using Excel**		
1.1	Creating new workbooks – Saving workbooks – Selecting cells – Entering text & numbers into cells – Naming the cell – Protecting Sheets & Cells - Name manager – Insert rows & columns	Create a new spreadsheet to do all kinds of analysis in the spreadsheet by knowing how to handle the cells.	K3
1.2	Auto Complete – Drop-down list – Dependent drop – down – Multiple dependent drop -	Able to do some editing work in the excel sheet with various sorting & filtering options	K3

	down – Using the "Window" Command group – Switching to Full screen view – Renaming workbooks – Move or copy Worksheets – Working with Excel file Formats.		
II	**Formatting & Advanced Filtering Using Excel**		
2.1	An Overview of formulas layout - Find & Replace – Sort & Filter (custom sort) - Data Validation – Remove duplicates – Import Data from different resources - Text to columns – usage of Paste Special – Freeze Panes	The excel spreadsheet can be made more comfortable to handle data in it with various formatting options to filter and sort the required data.	K2
2.2	Mail merge – Formatting Data & Conditional Formatting – Finding cells with conditional formatting – Clearing conditional formatting – Using table and cell styles - Excel Shortcuts	How Excel can be associated with E – mail with various formatting options	
III	**Pivot Table & Chart**		
3.1	Creating Pivot tables and Pivot charts – Manipulating a pivot table – Changing calculated value fields – Applying pivot table styles	Create an effective pivot table to handle the large data set in the required format.	K3
3.2	Creating pivot chart – Setting pivot table options – Sorting & Filtering pivot table data.	Create the Pivot chart to visualize the simplified data to understand better.	K3
IV	**Lookup Functions**		
4.1	Overview on the Statistical functions **-** The Horizontal lookup & Vertical lookup Functions – Using IF, AND, & OR functions – Index Match & Offsetting Functions	Able to use effectively some of the formulae which are essential for the arithmetic calculations like Lookup, IF, AND, OR etc	K3
V	**Applications of Macros & VBA**		
5.1	Recording Macros – Running & deleting Recorded Macros – The Personal Macro Workbook	Might be able to use automatically the set of algorithms or actions multiple times in the excel by recording.	K2, K4

| 5.2 | How to create 'Module' - Overview of VBA Coding & VBA objects - User Defined Functions using macro – Loops – For Each, For Next, Do While & Do Until loops – Debugging Macros. | Writing Coding for any actions can done through Excel macro-VBA | K4 |

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	-	M	L	-	L	L	-	M	L	H	H	-	M
CO2	H	-	M	M	L	M	L	L	L	H	H	-	M
CO3	H	M	-	L	L	L	-	L	L	M	M	-	-
CO4	-	M	M	L	-	L	L	M	L	H	H	H	M
CO5	H	H	M	M	L	L	L	-	L	-	-	M	L
CO6	H	H	M	M	M	L	L	L	L	-	M	M	L

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT
1.Continuous Assessment Test I, II
2.Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable)
3.End Semester Examination

INDIRECT
   1. Course-end survey

Mr. Y. Franklin Gnanaiah,

Course Coordinator.

SEMESTER:V   **CODE: U20AS5:3**

CREDITS: 4   **HOURS/WEEK: 5**

1. COURSE OUTCOMES

At the end of this course, the students will be able to

CO No.	Course Outcomes	Level	Unit Covered
CO1	Identify the different types of accounting statements.	K3	I
CO2	Utilize the accounting concepts to frame out the journals and ledger.	K4	II
CO3	Formulating the final accounts.	K6	III
CO4	Evaluate the company's financial performance through cash book and subsidiary books	K3	IV
CO5	Distinguish between different types of depreciation accounting.	K5	V
CO6	Predicting the errors in the Bank Reconciliation statements.	K6	V

2.A. SYLLABUS
UNIT 1: Accounting   (12 Hours)

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   (12 Hours)

Accounting equation-Accounting mechanics I: Journals Ledger posting and trial balance.

UNIT 3: Accounting mechanics II   (12 Hours)

Preparation of financial statements – Trading account - Profit and loss account and Balance sheet.

UNIT 4: Cash book and Subsidiary books   (12 Hours)

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   (12 Hours)

Rectification of errors - Depreciation accounting- Straight line method- Written down value method.

B. TOPICS FOR SELF STUDY

Sl. No	Topics	Reference
1.	Accounting Standard	http://www.mca.gov.in/MinistryV2/accountingstandards1.html
2.	Management Accounting	Management accounting (Sultan chand) by S.N Maheswari
3.	Management Problems	Theory and problems of management accounting, TMH, Khan and Jain.
4.	Principle of Accounts	Dalston L. Cecil and Jenitra L. Merwin, "Principles of Accountancy", Learntech Press, 2008.

C. TEXTBOOK
Jawaharlal and Seema Srivastava "Financial accounting".

D. REFERENCE
Theory and problems of management accounting, TMH, Khan and Jain.

3. SPECIFIC LEARNING OUTCOMES(SLO):

Unit/ Section	Course Contents	Learning Outcomes	Highest Blooms taxonomic Levels of Transaction
I	**Accounting**		
1.1	Introduction		
1.2	Basic Concepts of accounting		
1.3	Types of accounts		
1.4	Financial management ,cost accounting – definition	Apply the basic concepts of accounting.	K3
1.5	Comparison of financial management and cost accounting		
1.6	Advantages and limitations of financial and cost accounting		
II	**Accounting records and systems**		
2.1	Introduction		
2.2	Accounting equation		
2.3	Journals	Build the difference between the accounting equation and journals	K3
2.4	Ledger posting		
2.5	Trial balance		
III	**Accounting mechanics II**		
3.1	Single column cash book	Solve the problems of cash books in any type of column book.	
3.2	Double column cash book		
3.3	Three column cash book		
3.4	Petty cash book		
3.5	Purchase book		

3.6	Sales book		K3
3.7	Purchase return book		
3.8	Sales return book		
IV	**Cash book and Subsidiary books**		
4.1	Trading account	Analyse the various financial statements techniques .	
4.2	Profit and loss account		
4.3	Balance sheet		K4
V	**Bank reconciliation statement**		
5.1	Bank reconciliation statement	Aanlyse different types of bank reconciliation statement.	
5.2	Rectification of errors		
5.3	Depreciation accounting		K4
5.4	Straight line method		
5.5	Written down value method		

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO4
CO1	H	H	-	-	-	-	-	-	-	H	-	-	-
CO2	-	H	-	-	-	-	L	L	-	-	L	H	-
CO3	H	-	L	L	L	-	L	M	-	-	-	M	-
CO4	H	-	-	-	M	-	L	M	-	L	L	-	-
CO5	H	M	L	M	M	L	M	M	L	M	M	H	-
CO6	H	M	L	M	M	L	M	M	L	M	M	H	-

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT
1.Continuous Assessment Test: T1, T2 (Theory & Practical Components): Closed Book
2.Open Book Test.
3.Cooperative Learning Report, Assignment, Group Presentation, Group Discussion, project
Report, Field Visit Report, Poster Presentation, Seminar, Quiz (written).
4.Pre-Semester & End Semester Theory Examination

INDIRECT
1. Course end survey

Ms. R. Salai Jeevarathinam,

Course Coordinator.

SBEC-II: ACTUARIAL PROFESSION

SEMESTER: V   **CODE: U20AS5S2**
CREDITS: 2   **HOURS/WEEK: 2**

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1. COURSE OUTCOMES

At the end of the course, the students will be able to

CO No.	Course Outcomes	Level	Unit Covered
CO1	Summarize the concept of Actuarial Profession and its characteristics	K2	I
CO2	Utilize the regulatory measure in the profession	K3	II
CO3	Identify the role of Actuary	K3	III
CO4	Functions of Actuaries in the general insurance	K4	IV
CO5	Importance of the role of Actuaries in Health Insurance	K5	V
CO6	Discuss the duties and responsibilities of an actuary in other areas	K6	V

2.A. SYLLABUS

UNIT-I: Actuarial Profession Overview   **(5 hours)**

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

UNIT-II: Self-Regulatory Measures in Actuarial profession   **(5 hours)**

Need for self-regulation - Definition – Introduction - Classification of guidance notes – Procedures - Criteria for insurance of guidance notes.

UNIT-III: Role of Actuaries   **(5 hours)**

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-IV: Role of Actuary in General Insurance   **(5 hours)**

Premium Rating-Estimation of Liabilities- Collection and Presentation of information - Reinsurance requirements.

UNIT-V: Role of Actuary in Health Insurance & Other Area   **(5 hours)**

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.

B. TOPICS FOR SELF STUDY

Sl. No.	Topics	Reference
1.	Adopting new technology in General insurance	http://www.mca.gov.in/
2.	Usage of Artificial Intelligence in Insurance	http://www.IEEEjournals.org
3.	Role of actuary in banking sector	https://www.hindawi.com/journals/ijde/2016/8921710/
4.	Role of actuary in banking sector	https://www.hindawi.com/journals/ijde/2016/8921710/

C. TEXTBOOK

CT 9 - Business Awareness Module.

Chapter: 4.1 and 4.2.

D. REFERENCE

CP1- Actuarial Practice by IFOA

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course Contents	Learning Outcomes	Highest Blooms taxonomic Levels of Transaction
I	**Actuarial Profession Overview**		
1.1	Introduction to profession and professionalism Characteristics of the ideal profession Characteristics of the actuarial profession Skills required for the actuary	Explanation of the basic introduction for the actuarial field.	K2
II	**Self-Regulatory Measures in Actuarial profession**		
2.1	Need for self –regulation Introduction Classification of guidance notes Procedures Criteria for insurance of guidance notes	Utilize the rules and responsibilities of actuary.	K3

III	**Role of Actuaries**		
3.1	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	Utilize the role of actuary in field of life insurance and their duties.	K3
IV	**Role of Actuary in General Insurance**		
4.1.1	Premium rating Estimation of Liabilities Collection and presentation of information Reinsurance requirements	Analysis of premium rating and reinsurance requirements	K4
V	**Role of Actuary in Health Insurance & Other Area**		
5.1	Health insurance Demography Economics climate State provision of health and care services Valuation of insurance companies	Explanation of the various circumstances in the health insurance	K5
	Investment Actuary Advisor of brokers Financial consultants Corporate Finance Academics Capital projects	Discuss the various circumstances in other general areas	K6

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3
CO1	H	-	H	-	-	-	-	-	-	H	-	-
CO2	H	-	-	-	-	-	L	L	-	-	H	L
CO3	L	M	L	L	L	-	L	M	-	-	-	H
CO4	H	L	-	H	-	-	L	M	-	L	L	-
CO5	H	M	L	M	M	L	M	M	L	M	M	H
CO6	H	M	L	M	M	L	M	M	L	M	M	H

L-Low   M-Moderate   H- High

5.COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable)
3. End Semester Examination

INDIRECT
1. Course-end survey

Mr. J.A.S. Surendran,

Course Coordinator.

SEMESTER-VI

CORE X: OPERATIONS RESEARCH

SEMESTER: VI   **CODE: U19AS610**

CREDITS: 5   **HOURS/WEEK: 6**

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1. COURSE OUTCOMES

After completion of the course, the students will be able to,

CO. No.	Course Outcomes	Level	Unit Covered
CO1	Demonstrate the meaning of Operations Research and how to use in real-life decision-making problems.	K2	I
CO2	Build linear program in the event of minimum cost or maximum profit	K3	I
CO3	Solve linear programming problem using Graphical Method, Simplex Method, Big- M-Method and Two-Phase Simplex Method	K3	II
CO4	Assess dual simplex method in LPP	K5	III
CO5	Compare the different types of decision-making environments and the appropriate decision-making approaches and tools to be used in each type	K5	IV
CO6	Discuss the concept of PERT and CPM methods	K6	V

2. A. SYLLABUS

UNIT I: INTRODUCTION TO OR   **(12 Hours)**

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: TYPES OF LPP   **(12 Hours)**

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

UNIT III: DUAL LPP   **(12 Hours)**

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

UNIT IV: TRANSPORTATION PROBLEM   **(12 Hours)**

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: PERT & CPM   **(12 Hours)**

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

B. TOPICS FOR SELF STUDY

Sl. No	Topics	Reference
1.	Applications of Operations Research in real time applications	https://www.researchgate.net/publication/247766919_Review_Article_Applications_of_Operational_Research_to_the_Transportation_Problems_in_Developing_Countries_A_Review
2.	Sequencing related time applications	https://link.springer.com/article/10.1007/s10111-017-0443-1
3.	LPP in OR	https://ieeexplore.ieee.org/document/65868
4.	Optimization Research Of Generation Investment Based On Linear Programming Model	Https://Www.ScienceDIRECT.Com/Science/Article/Pii/S1875389212002519

C. TEXTBOOK

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

D. REFERENCE
Introduction to Operations Research by Fredrick S.Hillier and Gerald J. Lieberman

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course Content	Learning Outcomes	Highest Blooms taxonomic Levels of Transaction
I	**INTRODUCTION TO OR**		
1.1	Origin and development of O.R. Their nature and features Their applications Scientific methods Methodology of OR OpportUNITies and shortcomings Formulation of L.P.P. Graphical solution General L.P.P, Canonical and standard forms of L.P.P.	● Explain the concepts of Operations research	K2
II	**TYPES OF LPP**		
2.1	Simplex methods to solve LPP (Ordinary Simplex method, Big-	● Apply the different types	

	M-method, Two-phase-Simplex method)	of linear programming techniques.	K3
III	**DUAL LPP**		
3.1	Duality in L.P.P Introduction, General primal Dual pair, formulating a dual problem, Dual simplex method Sequencing	Construct the methods of formulating dual simplex method	K3
IV	**TRANSPORTATION PROBLEM**		
4.1	Introduction General 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.	Choose the transportation problem for Minimizing the transportation cost.	K5
V	**PERT & CPM**		
5.1	Network and basic components Logical sequencing Rules of network construction Critical path Analysis Probability consideration in PERT Distinction between PERT and CPM.	Explain the different types of network methods.	K5

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3
CO1	H	M	-	-	-	-	-	-	-	H	M	M
CO2	H	-	-	-	-	-	L	L	-	H	H	H
CO3	H	-	L	L	L	-	L	M	-	L	L	L
CO4	H	L	-	-	-	-	L	M	-	L	L	M
CO5	H	M	L	M	M	L	M	M	L	M	M	M
CO6	H	M	L	-M	M	L	M	M	L	M	M	M

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable)
3. End Semester Examination

INDIRECT
1. Course-end survey

Mr. K. Kapil Raj,
Course Coordinator.

SEMESTER: VI   **CODE: U20AS611**

CREDITS: 5   **HOURS/WEEK: 6**

1. COURSE OUTCOMES
After completion of the course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Make use of different algebraic and numerical techniques	K3	I
CO2	Solve problems using linear system of equations	K3	II
CO3	Make use of the techniques to find the interpolated values.	K3	III
CO4	Examine the suitable techniques to find the interpolated values for unequal intervals.	K4	III
CO5	Analyze the derivatives and deduct the values using Newton's formulae.	K5	IV
CO6	Solve ordinary differential equations using different methods	K6	V

2.A. SYLLABUS
UNIT I: Introduction to numerical analysis   (12 Hours)
The solution of algebraic and transcendental equations – Bisection method – Iteration method – Regula-Falsi method - Newton- Raphson method.

UNIT II: Linear System of Equations   (12 Hours)
Gauss elimination method – Gauss-Jordan method – Iterative methods – Jacobi method – Gauss-Seidal method.

UNIT III: Finite differences   (12 Hours)
Interpolation - Introduction – Gregory-Newton interpolation formulae – Interpolation with unequal intervals – Lagrange's interpolation formula.

UNIT IV: Numerical differentiation and integration   (12 Hours)
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   (12 Hours)
Taylor series method – Euler's method – Runge- Kutta methods – Adam's Moulton Method – Milne's Predictor corrector method.

B. TOPICS FOR SELF STUDY

Sl. No.	Topics	Reference
1.	Find the better solution in Runge-kutta method	https://www.hindawi.com/journals/ijde/2016/8921710/
2	Runge-kutta method solving fourth order	https://www.hindawi.com/journals/mpe/2015/893763/

3.	Interpolation getting better results	https://dx.doi.org/10.4135/9781412950589.n438
4.	Advanced trapezoidal rule for soil model	https://doi.org/10.1002/nag.615

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

D. REFERENCE
Numerical Methods: Problems and Solutions by Rajendra K.Jain and S.R.K.Iyengar

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit /Section	Course Contents	Learning Outcomes	Highest Blooms Taxonomic Levels of Transaction
1.	**Introduction to numerical analysis**		
1.1	Bisection method Iteration method Regular Falsi method Newton-Raphson method	Experiment with the different methods to find the accurate values in numerical methods .	K3
II	**Linear System of Equations**		
2.1	Gauss Elimination method Gauss Jordan method Jacobi methods Gauss – seidal methods	Apply the various DIRECT methods for solving the system of equations.	K3
III	**Finite differences**		
3.1	Forward difference Backward difference Difference of polynomial Factor Polynomial Gregory-Newton interpolation formulae Lagrange's interpolation formula Inverse Interpolation	● Identify the difference between the forward and backward difference.	K3
		● Examine the factorial as well as difference in polynomial.	K4
IV	**Numerical differentiation and integration**		
4.1	Newton's forward differentiation formula A general quadrature formula Trapezoidal rule Simpson's one third rule Simpson's three-eighth rule	Evaluate the forward differentiation and integration problems.	K5
V	**Numerical solution of ordinary differential equation**		

5.1	Taylor series Euler's method Runge-Kutta methods Milne's predicator methods Milne's corrector methods	Examine the methods for solving ordinary differential equations.	K6

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3
CO1	H	M	-	-	-	-	-	-	-	H	M	M
CO2	H	-	-	-	-	-	L	L	-	H	H	H
CO3	H	-	L	L	L	-	L	M	-	L	L	L
CO4	H	L	-	-	-	-	L	M	-	L	L	M
CO5	H	M	L	M	M	L	M	M	L	M	M	M
CO6	H	M	L	-M	M	L	M	M	L	M	M	M

L-Low   M-Moderate   H- High

5.COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable)
3. End Semester Examination

INDIRECT
1. Course-end survey

Ms. H. Anitha,
Course Coordinator.

CORE-XII: GROUP INSURANCE AND RETIREMENT BENEFITS

SEMESTER: VI   **CODE: U20AS612**

CREDITS: 5   **HOURS/WEEK: 5**

1. COURSE OUTCOMES
After completion of the course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Summarize the different types of retirement benefits	K2	I
CO2	Outline the different types of group insurance schemes	K2	II
CO3	Analyze the different ways of arranging schemes	K4	III
CO4	Assess past service benefits and future service benefits	K5	IV
CO5	Elaborate the treatment of retirement provisions	K6	V
CO6	Elaborate documentation of trust deeds and rules	K6	V

2. A. SYLLABUS
UNIT I: Historical background to employee benefits in India   **(10 Hours)**
Provident funds – Super annuation - Gratuity schemes.

UNIT II: Group Insurance Schemes   **(10 Hours)**
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   **(10 Hours)**
 Different ways of arranging schemes – Unfunded schemes and funded schemes – Trustee administered and insured schemes.

UNIT IV: Methods of costing   **(10 Hours)**
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   **(10 Hours)**
Treatment of retirement provisions under provident, gratuity and superannuation funds – Documentation of Trust deeds and Rules. Data processing and Group Schemes.

C. TEXTBOOK

IC 83 of Insurance Institute of India.

D. REFERENCE
Group Insurance by William.F. Bluhm, Robert B. Cumming

3. SPECIFIC LEARNING OUTCOMES(SLO):

Unit /Sec tion	Course Contents	Learning Outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Historical background to employee benefits in India**		
1.1	Historical background to employee benefits in India: Provident funds Superannuation Gratuity schemes	Compare the pros and cons of different provident fund schemes offered in the past Summarize the superannuation schemes Illustrate the gratuity benefits offered to low-income workers	K2
II	**Group Insurance Schemes**		
2.1	Group Insurance Schemes: Segments of group schemes market Origin and development of group schemes and characteristics of groups Group underwriting, rate making and experience rating adjustment	Compare the different segments based on the relationship of the persons covered of the group insurance market Show their characteristics and other factors of group insurance and classify them on the basis of contribution Infer the method by which group insurance is underwritten	K2
III	**Group Insurance Schemes**		
	Gratuity and Superannuation Schemes: Different ways of arranging schemes - Unfunded schemes and funded schemes Trustee administered and insured schemes.	Examine the funded and unfunded pension plans	K4
IV	**Methods of costing**		
4.1	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	Explanation of the regulatory and government rules to be implemented in group insurance plans, documentation report to the government and regulatory bodies	K5
V	**Legal aspects and taxation**		

5.1	Legal aspects and taxation: Treatment of retirement provisions under provident, gratuity and superannuation funds Documentation of Trust deeds and Rules Documentation of Data processing and Group Schemes	Discuss about the regulatory and government rules to be implemented in group insurance plans, documentation report to the government and regulatory bodies	K6

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	H	H	H	H	M	M	M	M	M	M	M	M	M
CO2	M	H	M	M	M	-	-	-	-		H	M	-
CO3	M	H	H	M	-	-	-	-	-				M
CO4	H	M	M	H	H	L	H	L	L	M	-	-	-
CO5	H	H	H	H	-	M	M	M	M				
CO6	H	M	M	H	-	H	H	H	H	M	M	L	M

L-Low **M-Moderate** **H- High**

5.COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable)
3. End Semester Examination

INDIRECT
1. Course-end survey

Mr. J.A.S. Surendran,

Course Coordinator.

CORE XIII: REINSURANCE MANAGEMENT

SEMESTER: VI   **CODE: U20AS613**

CREDITS: 5   **HOURS/WEEK: 6**

1. COURSE OUTCOMES

After completion of the course, the students will be able to

CO. NO.	COURSE OUTCOMES	Level	Unit Covered
CO1	Demonstrate the concept of Reinsurance and its importance.	K2	I
CO2	Identify the factors influencing reinsurance business.	K3	II
CO3	Analyze the usage of reinsurance in various types of industry.	K4	III
CO4	Functions of regulatory bodies in reinsurance business	K4	IV
CO5	Prioritize the importance of proportional and non- proportional reinsurance arrangements in the insurance industry.	K5	V
CO6	Adapt the suitable alternative risk transfer in insurance contract	K6	V

2. A. SYLLABUS

UNIT I: Introduction to reinsurance   (12Hours)

Nature of reinsurance – Analysis of factors that influence results– Historical background– Reinsurance in India before & after nationalization and liberalization – GIC Re – Regional co- operation – Functions of reinsurance -Advantages, **Forms of Reinsurance:** Facultative reinsurance– Treaty reinsurance–Facultative Obligatory Treaty – Considerations for facultative placements.

UNIT II: Methods of Reinsurance- Proportional reinsurance   (12Hours)

Surplus–QuotaShare– Proportional Treaty – Bordereaux – Premiums – Ceding Commission – Claims – Quota Share Treaty – Quota Share & surplus combined – Specimen Treaty Slip.

UNIT III: Methods of Reinsurance – Non-Proportional reinsurance   (12Hours)

Excess of Loss – Working (PerRisk)XL-CatastropheXL–StopLossXL–AggregateXL–Non- proportional Treaty–Ultimate Net Loss– reinsured Retention–Premium–Burning Cost– Exposure Rating/ Pareto Loss Distribution – Reinstatement – Claims – Inception & Termination - Specimen Treaty Slip.

UNIT IV: Retentions   (12Hours)

Setting Retentions – General Considerations – Factors influencing retentions – Types of retentions – Accumulations within and between branches – Retentions for Property insurance – Engineering insurance – Accident & Liability insurance – Marine Cargo & Hull insurance – Aviation insurance – Life insurance – Special factors for different classes of Reinsurance.

UNIT V: IRDA Reinsurance Regulations   **(12hours)**

Applicability - Reinsurance Programme - Retention Policy - Reinsurance Arrangements - Maintenance of Records - Cross Border Reinsurer (CBR)-Procedures for Reinsurance Placements- Alternate Risk Transfer(ART).

B. TOPICS FOR SELF STUDY

S.No	Topics	Reference
1	New method of reinsurance arrangement	https://en.wikipedia.org/wiki/Reinsurance
2	New technology of reinsurance underwriting	https://www.insurancejournal.com/magazines/mag-features/2019/10/21/545857.htm
3	Improvement in IRDAI reinsurance regulations	https://www.irdai.gov.in/ADMINCMS/cms/frmwhats_List.aspx
4	New technology for reinsurance claim settlement process	https://www.oecd.org/pensions/Technology-and-innovation-in-the-insurance-sector.pdf

C. TEXTBOOK
IC85 - Insurance Institute of India

D. REFERENCE

Reinsurance by R.L.Carter.

3.SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course contents	Learning outcomes	Highest Blooms taxonomic Levels of Transaction
I	**Introduction to reinsurance**		
1.1	Nature of reinsurance Historicalbackground ReinsuranceinIndiabefore&afternationalization and liberalization GIC Re Regional co-operation	Explain the concept of reinsurance contract	K2

	Functions of reinsurance Advantages		
1.2	Facultative reinsurance Treaty reinsurance Facultative Obligatory Treaty Considerations for facultative placements.	Explain the types of reinsurance contract	K2
II	**Methods of Reinsurance- Proportional reinsurance**		
2.1	Surplus QuotaShare Proportional Treaty Bordereaux Premiums Ceding Commission Claims Quota Share Treaty Quota Share & surplus combined Specimen TreatySlip.	Analyse the proportional reinsurance contract	K4
III	**Methods of Reinsurance – Non-Proportional reinsurance**		
3.1	Working(Per Risk)XL Catastrophe XL Stop Loss XL Aggregate XL Non-proportional Treaty Ultimate Net Loss Reinsured Retention Premium Burning Cost Exposure Rating / Pareto Loss Distribution Reinstatement	List the non-proportional reinsurance contract	K4

	Claims		
	Inception & Termination - Specimen Treaty Slip.		
IV	**Retentions**		
4.1	Setting Retentions General Considerations Factors influencing retentions Types of retentions Accumulations within and between branches Retentions for Property insurance Engineering insurance Accident & Liability insurance Marine Cargo & Hull insurance Aviation insurance Life insurance Special factors for different classes of Reinsurance	Classify the retention level in reinsurance contract	K2
V	**IRDA Reinsurance Regulations**		
5.1	IRDA Reinsurance Regulations Applicability Reinsurance Programme Retention Policy Reinsurance Arrangements Maintenance of Records Cross Border Reinsurer(CBR) Procedures for Reinsurance Placements Alternative Risk Transfer(ART)	Examine the alternative risk transfer	K4

4. Mapping Scheme for the PO, PSOs and COs

Mappin g	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PS O 1	PS O 2	PSO 3	PSO 4
CO1	H	H	H	H	M	M	M	M	M	M	M	M	M
CO2	M	H	M	M	M	-	-	-	-		H	M	-
CO3	M	H	H	M	-	-	-	-	-				M
CO4	H	M	M	H	H	L	H	L	L	M	-	-	-
CO5	H	H	H	H	-	M	M	M	M				
CO6	H	M	M	H	-	H	H	H	H	M	M	L	M

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT

1.Continuous Assessment Test I, II

2.Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable

3.End Semester Examination

INDIRECT

1. Course-end survey

Mrs. S. Babylatha,

Course Coordinator.

CORE XIV: INTRODUCTION TO TIME SERIES

SEMESTER: VI   **CODE: U20AS614**

CREDITS: 4   **HOURS/WEEK: 5**

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1. COURSE OUTCOMES

After completion of the course, the students will be able to

CO. No	Course Outcomes	Level	Unit Covered
CO1	Develop to handle the different kinds of price index numbers.	K3	I
CO2	Develop to handle the different kinds of quantity index numbers	K3	II
CO3	Make use of index numbers to create time series for predicting future values	K3	III
CO4	Categorize the trend analysis techniques for different time periods.	K4	III
CO5	Evaluate the average in different seasonal variations	K5	IV
CO6	Adapt the suitable techniques to find the interpolated and extrapolated values.	K6	V

2.A.SYLLABUS

UNIT I: Index Numbers   **(12 Hours)**

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

UNIT II: Quantity Index Numbers   (**12 Hours)**

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 – Limitation of Index Numbers.

UNIT III: Time Series   **(12 Hours)**

Meaning – Definition – Uses of Time Series – Models – Secular Trend–SeasonalVariation–CyclicalVariation–IrregularVariation–PreparationDatafor Analysis – Measurement of Secular Trend – Graphic Method – Semi average Method – Moving Average method – Method of Least Square - Parabola Curve - Selecting a type of trend – Choice – Conversion – Shifting to origin.

UNIT IV: Measurement of Seasonal Variation   (**12 Hours)**

Method of simple average method – Ratio to trend Method–Ratio to Moving average method–Link relative method–Measurement of Cyclic Variation – Measurement of Irregular Variations.

UNIT V: Interpolation and Extrapolation (12 Hours)

Meaning - Significance of Interpolation – Assumption – Method 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.

B. TOPICS FOR SELF STUDY

Sl . No.	Topics	Reference
1.	Time Series Graphs	https://www.statmethods.net/graphs/index.html
2.	Interpolation	https://towardsdatascience.com/how-to-interpolate-time-series-data-in-apache-spark-and-python-pandas-part-1-pandas-cff54d76a2ea
3.	Seasonal Variations	https://www.playaccounting.com/qa/mqa/cm-exp/time-series-analysis-and-seasonal-variations/
4.	Moving Average	https://otexts.com/fpp2/moving-averages.html

C. TEXTBOOK

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

D. REFERENCE

Practical Time Series Analysis Prediction with Statistics and Machine Learning By Aileen Nielsen · 2019

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/Section	Course Content	Learning Outcomes	Highest Blooms taxonomic Levels of Transaction
I	**Index Numbers**		
1.1.1	Introduction	Identify the types of Index numbers. Solve the index based problem.	K3
1.1.2	Types of Index Number		
1.1.3	Interpretation of Index Numbers		
1.1.4	Problems of Construction		
II	**Quantity Index Numbers**		
2.1.1	Quantity Index Numbers		

2.1.2	Value Index Numbers	Apply the different types of index. Evaluate the consumer price index	K3
2.1.3	Factor Reversal Test		
2.1.4	Base Shifting – Deflating of Index Numbers		
2.1.5	Consumer Price Index		
2.1.6	Family Budget		
2.1.7	Limitations of Index Numbers		
III	**Time Series**		
3.1.1	Uses of Time Series	Construct a parabola curve. Evaluate the methods of least square	K3
3.1.2	Measurement of Secular Trend		
3.1.3	Method of Least Squares		
3.1.4	Parabola Curve		
3.1.5	Selecting a type of trend	Examine the secular trend	K4
3.1.6	Shifting to origin		
IV	**Measurement of Seasonal Variation**		
4.1.1	Measurement of Seasonal Variation	Evaluate time series for predicting future values. Identify the trend. Knowledge to analyses the trend value by using different methods	K5
4.1.2	Method of simple average method		
4.1.3	Ratio to trend Method		
4.1.4	Ratio to Moving average method		
4.1.5	Measurement of Cyclical Variation		
V	**Interpolation and Extrapolation**		
5.1.1	Newton's Gauss (Backward) Method	Solve for different types of methods of interpolation. .	K6
5.1.2	Newton's Method of Backward		
5.1.3	Newton's divided difference method		
5.1.4	Lagrange's method and parabolic curve fitting		

4. Mapping Scheme for the PO, PSOs and COs

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	M	M	H	L	-	H	L	-	-	L	L	L	L
CO2	H	M	H	-	-	H	L	-	-	-	-	-	-
CO3	H	H	H	H	L	H	M	L	L	L	H	H	L
CO4	H	L	H	-	L	H	L	H	L	L	L	L	H
CO5	H	L	H	L	L	H	L	-	H	H	L	H	-
CO6	H	L	H	M	M	H	H	H	H	H	H	H	H

L-Low   M-Moderate   H- High

5. COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable)
3. End Semester Examination

INDIRECT
1. Course-end survey

Mr. J.A.S. Surendran,

Course Coordinator.

SBEC III - MATHEMATICS FOR COMPETITIVE EXAMINATIONS

SEMESTER: VI   **CODE: U19AS6S3**

CREDITS: 2   **HOURS/WEEK: 2**

1. COURSE OUTCOMES
After completion of the course, the students will be able to

CO. NO.	Course Outcomes	Level	Unit Covered
CO1	Build themselves involved to attend civil service examinations	K3	I
CO2	Assess themselves to the current demand in the job market	K5	II
CO3	Analyze the techniques to solve logical math efficiently	K4	III
CO4	Solving the Reasoning questions with full confident	K3	IV
CO5	Plan to take up the exams on time with no fear	K3	IV
CO6	Construct the Aptitude level of thinking	K6	V

2.A. SYLLABUS

UNIT I: Introduction to Civil Service Examinations   **(5 Hours)**

Civil Service examinations - UPSC, SSC, Railway, Defense, Public & Security, Bank Recruitment and other Miscellaneous examinations.

UNIT II: Logical Reasoning   **(5 Hours)**

Numerical ability tests, intelligence tests, reasoning tests – Statistical analysis – figural relation-

Behavioral ability – Comprehension – Evaluation, Retention.

UNIT III: Number System   **(5 Hours)**

Numbers - HCF & LCM - Decimal Fractions - Simplification – Square roots and Cube roots –

Percentage - Average-Ratio and Proportion – Profit and

UNIT IV: Problems related to Time   **(5 Hours)**

Time and Work - Time and Distance - Problems on Trains – Problems on Numbers - Problems

on ages - Simple interest - Compound interest.

UNIT V: Area, Volume and other applications   **(5 Hours)**

Area-Volume & Surface Areas - Chain rule - Calendar-Stock & Shares - Banker's discount –

Data analysis - Odd man out & Series.

B. TOPICS FOR SELF STUDY

Sl.No.	Topics	Reference
1	List of competitive exams in India	https://scoop.eduncle.com/list-of-competitive-exams-in-india
2	Preparation strategy for competitive examinations	https://byjus.com/govt-exams/competitive-exams-preparation-strategy/
3	Study material for quantitative aptitude	https://www.technicalsymposium.com/allaptitudematerials.html
4	Online test on aptitude along with explanation	https://www.indiabix.com/aptitude/questions-and-answers/

C. TEXTBOOK
R.S. Aggarwal, Objective Arithmetic, S. Chand And Company Ltd., New Delhi, 2003.

D. REFERENCE
Magical Book On Quicker Maths, M.Tyra

3. SPECIFIC LEARNING OUTCOMES(SLO)

Unit/ Section	Course Content	Learning outcomes	Highest Blooms Taxonomic Levels of Transaction
I	**Introduction to Civil Service Examinations**		
1.1	Civil Service examinations - UPSC, SSC, Railway, Defence, Public & Security, Bank Recruitment and other	Organize the competitive exams and apply the preparations needed to clear those exams.	K3

	Miscellaneous examinations		
II	**Logical Reasoning**		
2.1	Numerical ability tests, intelligence tests, reasoning tests – Statistical analysis – figural relation – Behavioral ability – Comprehension – Evaluation, Retention	Assess the problem with reasoning	K5
III	**Number System**		
3.1	Numbers - HCF & LCM - Decimal Fractions - Simplification – Square roots and Cube roots – Percentage - Average- Ratio and Proportion – Profit and Loss	Analyze the basic calculations in mathematics	K4
IV	**Problems related to Time**		
4.1	Time and Work - Time and Distance - Problems on Trains – Problems on Numbers - Problems on ages - Simple interest - Compound interest	Solve the problem to various situations	K3
V	**Area, Volume and other applications**		
5.1	Area-Volume & Surface Areas - Chain rule - Calendar-Stock & Shares - Banker's discount - Data analysis - Odd man out & Series	Make up the analytical problems	K6

4. Mapping Scheme for the PO, PSOs and COs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	M	-	L	-	-	-	M	H	L	M	-	-	M
CO 2	H	H	M	H	M	H	M	L	H	H	H	M	-
CO 3	H	H	M	H	H	H	H	M	H	H	L	L	L

CO 4	H	H	H	H	H	M	M	H	H	H	H	M	M
CO 5	H	H	M	H	M	H	M	L	H	M	M	L	L
CO 6	H	H	H	H	H	M	H	M	M	H	H	H	H

<div align="center">L-Low   M-Moderate   H- High</div>

5. COURSE ASSESSMENT METHODS

DIRECT
1. Continuous Assessment Test I, II
2. Open book test; Cooperative learning report, Assignment; Journal paper review, Group Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable)
3. End Semester Examination

INDIRECT
1. Course-end survey

Ms. R. Salai Jeevarathinam,
Course Coordinator.