பெரியார் பல்கலைக்கழகம்

PERIYAR UNIVERSITY

SALEM – 636 011, TAMILNADU

NAAC A Grade – State University – NIRF Rank 68

DEGREE OF BACHELOR OF SCIENCE

CHOICE BASED CREDIT SYSTEM

Syllabus for

B.SC. MATHEMATICS

(ACTUARIAL SCIENCE)

(SEMESTER PATTERN)
(For Candidates admitted in the Colleges affiliated
to Periyar University from 2019 - 2020 onwards)

REGULATIONS

OBJECTIVES OF THE COURSE

Mathematics is a key to success in the field of science and engineering. Mathematics plays an important role in the context of globalization of Indian economy, modern technology, and computer science and information technology. Today, students need a thorough knowledge of basic principles, methods, results and a clear perception of the power of mathematical ideas and tools to use them effectively in modeling, interpreting and solving the real world problems. The syllabus of this program is aimed at preparing the students with the latest developments and put them on the right track to fulfill the present requirements.

COMMENCEMENT OF THIS REGULATION

This regulation shall take effect from the academic year 2019 – 2020, i.e, for the students who are admitted to the first year of the course during the academic year 2019 – 2020 and thereafter.

ELIGIBILITY

Refer this office circular No: PU/R/AD-1/UG/PG/Programmes Eligibility/2019 Dated: 16-04-2019.

DEFINITIONS

Programme: Program means a course of study leading to the award of the degree in a discipline.

Course: Course refers to the subject offered under the degree programme.

SYLLABUS

The syllabus of the UG degree has been divided into the following four categories:

Part I: Tamil / Other Languages.

Part II: English Language.

Part III: Core Courses, Elective Courses and Allied Courses.

Part IV: Skill Based Elective Courses, Non-Major Course,

Environmental Studies and Value Education.

- **Elective Course:** There are 6 Elective Courses offered for B.Sc. Mathematics (Actuarial Science) students.
- **Skill Based Elective Course:** This course aims to impart advanced and recent developments in the concerned discipline.
- **Non-Major Elective Course:** Irrespective of the discipline the student can select papers that are offered by other disciplines as non-major course.

CREDITS

Weightage given to each course of study is termed as credit.

CREDIT SYSTEM

The weightage of credits are spread over to different semester during the period of study and the cumulative credit point average shall be awarded based on the credits earned by the students. A total of 140 credits are prescribed for the under graduate programme.

DURATION OF THE COURSE

The candidates shall complete all the courses of the programme within 5 years from the date of admission. The programme of study shall consist of six semesters and a total period of three years with 140 credits. The programme of study will comprise the course according to the syllabus.

EXAMINATIONS

The course of study shall be based on semester pattern with Internal Assessment under Choice Based Credit System.

The examinations for all the papers consist of both Internal (Continuous Internal Assessment-CIA) and External (end semester) theory examination. The theory examination shall be conducted for three hours duration at the end of each semester. The candidates failing in any subjects(s) will be permitted to appear for the same in the subsequent semester examinations.

STRUCTURE OF THE COURSE

Part		Paper Code	Title	Hours	Credit
Semester - I					
I	Language	19UFTA01	Tamil -I	6	3
II	Language	19UFEN01	English - I	6	3
III	Core- I	19UMAASC01	Classical Algebra	5	4
	Core - II	19UMAASC02	Calculus	5	4
	Allied - I	19UMAASA01	Mathematical Statistics -I	6	4
IV	Value Education	-	Yoga	2	2
Semester - II					
I	Language	19UFTA02	Tamil –II	6	3
II	Language	19UFEN02	English - II	6	3
III	Core- III	19UMAASC03	Trigonometry and Vector Calculus	4	4
	Core - IV	19UMAASC04	Micro Economics	4	4
	Allied - II	19UMAASA02	Mathematical Statistics -II	6	4
	Allied - II	19UMAASA03	Practical – 'R' Programming	2	2
IV	EVS	19UMAASES	Environmental Science	2	2
Semester - III					
III	Core- V	19UMAASC05	Differential Equations and Laplace Transforms	6	4
	Core - VI	19UMAASC06	Basic Accounting Concepts	6	4
	Core - VII	19UMAASC07	Sampling Theory	6	4
	Elective - I	19UMAASE01	Life Insurance & General Insurance	5	3
	Allied - III	19UMAASA04	Physics –I	5	4
IV	NMEC	19UMAASN01	NMEC - I	2	2
Semester - IV					
III	Core - VIII	19UMAASC08	Financial Mathematics - I	5	5
	Core - IX	19UMAASC09	Basics of Life Contingencies	5	4
	Core - X	19UMAASC10	Mortality and Markov Chains	4	4
	Elective - II	19UMAASE02	Operation Research	5	4

	Allied - IV	19UMAASA05	Physics – II	5	4
	Allied - IV	19UMAASA06	Physics Practical	2	2
IV	SBEC - I	19UMAASS01	Group Insurance	2	2
	NMEC	19UMAASN02	NMEC - II	2	2
Semester - V					
III	Core - XI	19UMAASC11	Abstract Algebra – I	6	5
	Core - XII	19UMAASC12	Real Analysis – I	6	5
	Core - XIII	19UMAASC13	Financial Mathematics - II	6	5
	Elective – III	19UMAASE03	Time Series and Forecasting	5	4
	Elective - IV	19UMAASE04	Insurance Underwriting and Risk Management	5	4
IV	SBEC - II	19UMAASS02	LaTex Practical	2	2
Semester - VI					
III	Core - XIV	19UMAASC14	Abstract Algebra – II	6	5
	Core - XV	19UMAASC15	Real Analysis – II	6	5
	Core - XVI	19UMAASC16	Complex Analysis	6	5
	Elective – V	19UMAASE05	Financial Management	5	4
	Elective - VI	19UMAASE06	Mathematical Modeling	5	4
IV	SBEC - III	19UMAASS03	Retirement Benefits	2	2

ALLIED SUBJECTS FOR B.Sc. MATHEMATICS (A.S):

SUBJECT	CODE
Mathematical Statistics - I	19UMAASA01
Mathematical Statistics - II	19UMAASA02
Practical – „R" Programming	19UMAASA03
Physics – I	19UMAASA04
Physics – II	19UMAASA05
Practical - Physics	19UMAASA06

SKILL BASED ELECTIVE COURSES:

SUBJECT	SUBJECT CODE
Group Insurance	19UMAASS01
Latex Practical	19UMAASS02
Retirement Benefits	19UMAASS03

UNIFORMITY IN THE NUMBER OFQUESTIONS IN EACH PAPER:

Each theory paper shall consist of five units. The Question paper shall consist of questions uniformly distributed among all the units.

1. **QUESTION PAPER PATTERN FOR THE THEORY PAPERS**

Duration: **Three Hours**   Maximum Marks: **75**

Part A: (10 X 2 = 20 marks)

Answer ALL Questions

(Two Questions from Each Unit)

Part B: (5 X 5 = 25 marks)

Answer ALL Questions

(One Question from Each Unit with internal choice)

Part C: (3 X 10 = 30 marks)

Answer Any THREE Questions out of Five Questions

(One Question from Each Unit)

2. MARKS AND QUESTION PAPER PATTERN FOR PRACTICALPAPERS MARKS

MAXIMUM:**100 Marks**   INTERNAL MARK: **40 marks**

EXTERNAL MARK: **60 marks**

(Practical Exam -45 marks+ Record - 15 marks)

QUESTION PATTERN FOR THE PRACTICAL EXAM PAPERS

Answer any THREE questions out of 5 questions (3 x 15 = 45 marks)

PASSING MINIMUM

i) The Candidates shall be **declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Theory Exam mark) with minimum of 30 marks in the Theory Exam conducted by the University.**

ii) The Candidates shall be **declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Theory Exam mark) with minimum of 18 marks out of 45 marks Practical Exam conducted by the University.**

CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in the First class. All other successful candidates shall be declared to have passed in the second class. Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in First Class with Distinction provided they pass all the examinations, prescribed for the course at the first appearance. Candidates who pass all the examinations prescribed for the course in the first attempt and within a period of three academic years from the year of admission to the course only eligible for University Ranking.

CONVERSION OF MARKS TO GRADE POINTS AND LETTER GRADE
(Performance in a Course/Paper)

RANGE OF MARKS	GRADE POINTS	LETTER GRADE	DESCRIPTION
90-100	9.0-10.	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
40-49	4.0-4.9	C	Satisfactory
00-39	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

C_i = Credits earned for course i in any semester
G_i = Grade Point obtained for course i in any semester
 n = refers to the semester in which such course were credited

Grade point average (for a Semester):
Calculation of grade point average semester-wise and part-wise is as

follows:

GRADE POINT AVERAGE [GPA] = ΣiCiGi / ΣiCi

Sum of the multiplication of grade points by the credits of the entire programme under each part

CGPA = ...

-Sum of the credits of the courses of the entire programme under each part

Calculation of Grade Point Average (CGPA) (for the entire programme):
A candidate who has passed all the examinations under different parts (Part-I to V) is eligible for the following part wise computed final grades based on the range of CGPA.

CUMULATIVE GRADE POINT AVERAGE [CGPA] = ΣnΣiCniGni / ΣnΣiCni

Sum of the multiplication of grade points by the credits of the entire programme under each part

CGPA = ...
- - - - -
Sum of the credits of the courses of the entire programme under each part

CGPA	GRADE
9.5 – 10.0	**O+**
9.0 and above but below 9.5	**O**
8.5 and above but below 9.0	**D++**
8.0 and above but below 8.5	**D+**
7.5 and above but below 8.0	**D**
7.0 and above but below 7.5	**A++**
6.5 and above but below 7.0	**A+**
6.0 and above but below 6.5	**A**
5.5 and above but below 6.0	**B+**
5.0 and above but below 5.5	**B**
4.5 and above but below 5.0	**C+**
4.0 and above but below 4.5	**C**
0.0 and above but below 4.0	**U**

Classification of Successful candidates
A candidate who passes all the examinations in Part I to Part V securing following CGPA and Grades shall be declared as follows **for Part I or Part II or Part III**:

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT
9.5 – 10.0	O+	First Class – Exemplary *
9.0 and above but below 9.5	O	First Class with

		Distinction*
8.5 and above but below 9.0	D++	
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	
6.5 and above but below 7.0	A+	First Class
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	
5.0 and above but below 5.5	B	Second Class
4.5 and above but below 5.0	C+	
4.0 and above but below 4.5	C	Third Class

Conferment of the Degree

No candidate shall be eligible for conferment of the Degree unless he / she

  i.   Has undergone the prescribed course of study for a period of not less than six semesters in an institutionapproved by/affiliated to the University or has been exempted from in the manner prescribed and haspassed the examinations as have been prescribed therefor.

  ii. Has completed all the components prescribed under Parts I to Part V in the CBCS pattern to earn140 credits.

  iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificateissued by the Principal of the College.

Ranking

   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking shall be confined to 10 % of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.

   The improved marks shall not be taken into consideration for ranking.

NOTE:
   ➢
      All the Papers (including computer papers) specified in this syllabus should be handled and valued by faculty of Mathematics Department only.

➤ Both Internal and External Examiners for University Practical Examination should be appointed (including computer papers) fromfaculty of Mathematics only.

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PART - III

CORE COURSES SYLLABUS

19UMAASC01	CLASSICAL ALGEBRA	L	T	P	C
		4	1	0	4

Unit – I: Binomial Series

Binomial theorem for a positive integral index – Binomial theorem for a rational index – Summation of Binomial series. Exponential series – Exponential series for all real Values of x – Standard results for the Exponential series – Logarithmic series – Problems. (Chapter -2, Chapter-3 and Chapter-4)

Unit – II: Matrices

Test for consistency of linear equations – Characteristic equation – Characteristic roots and characteristic vectors of a matrix – Cayley–Hamilton theorem - Similarity of matrices - Diagonalizable matrix – Problems.
(Chapter -6 (Page 6.38 to Page 6.82))

Unit – III : Theory of equations

Fundamental theorem in the theory of equations – Relation between the roots and coefficients of an equation – Imaginary and irrational roots – Symmetric functions of the roots of an equation interms of its coefficients – Problems. (Chapter -7 (Page 7.1 to Page 7.30))

Unit – IV: Theory of equations

Reciprocal equations – Transformation of equations – Multiplication of roots by m – Diminishing the roots of an equation – Removal of a term of an equation – Problems.

(Chapter 7 (page 7.30 to page 7.56)).

Unit – V: Roots of Polynomial Equations

Descarte‟s rule of signs – Descarte‟s rule of signs for negative roots of an equation – Horner‟s method for approximation of roots of a polynomial equation – Newton‟s Method of evaluating a real root correct to given decimal places – Problems.
(Chapter – 7 (Page 7.57 to Page 7.67))

Text Book:

Dr.P.R.Vittal and V.Malini, Algebra, Analytical Geometry and Trigonometry, Margham Publications, Chennai, 2008.

Reference Books:

1. T.K.ManicavachagomPillai& others, Algebra Volume I, S.Viswanathan Printers and publishers Pvt. Ltd, 2003.
2. Joseph A. Mangaladoss and others,   Classical Algebra, Presi – Persi Publications, 2016.
3. S.Arumugam & Isaac, Algebra (Theory of equations, Theory of numbers and Trigonometry), New Gamma Publications, 2011.

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19UMAASC02	**CALCULUS**	L	T	P	C
		4	1	0	4

Subject description:
This course presents the idea of curvatures, integration of different types of functions, its geometrical applications, double, triple integrals and improper integrals.
Goal:
To enable the students to learn and gain knowledge about
curvatures, integrations and its geometrical applications.
Objectives:
On successful completion of course the students should have gain about the evolutes and envelopes, different types of integrations, its geometrical application, proper and improper integration.

UNIT I: Differentiation
Curvature-radius of curvature in Cartesian and polar forms-evolutes and

envelopes- pedal equations- total differentiation- Euler"s theorem on homogeneous functions.

UNIT II: Integration
Integration of f"(x)/f(x), f'(x)√f(x), (px+q)/√(ax^2+bx+c)], [√(x-a)/(b-x)], √(x-a)(b-x), 1/[√(x-a)(b-x), 1/(acosx+bsinx+c), 1/(acos^{2}x+bsin^{2}x+c), Integration by parts.

UNIT III: Multiple Integrals
Reduction formulae- problems- evaluation of double and triple integrals-applications to calculations of areas and volumes-areas in polar coordinates.

UNIT IV: Multiple Integrals
Change of order of integration in double integral- Jacobions.- change of variables in double and triple integrals.

UNIT V: Beta and Gamma functions
Beta and Gamma integrals-their properties, relation between them-evaluation of multiple integrals using Beta and Gamma functions.

Treatment as in
 S. Narayanan and T.K.M. Pillai, Calculus, Vol 1 and Vol 2, Viswanathan Publishers, 2008.

Reference:
1. P. Kandasamy & K.Thilagarathy, Mathematics for BSc – Vol I and. II, S.Chand and Co, 2014.
2. Shanthi Narayanan & J.N.Kapoor, A Text book of calculus, S.Chand & Co., 2014.

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19UMAASC03	**TRIGONOMETRY AND VECTOR CALCULUS**	L	T	P	C
		3	1	0	4

Objective: To make the students understand the expansion of trigonometric functions, line integral, surface integral and volume integral.

UNIT I: Expansions and Hyperbolic Functions

Expansion of $\cos n\phi$, $\sin n\phi$, $\cos^n \phi$, $\sin^n \phi$ – Hyperbolic functions – Separation of real and imaginary parts of $\sin(\alpha + i\beta)$, $\cos(\alpha + i\beta)$, $\tan(\alpha + i\beta)$, $\sinh(\alpha + i\beta)$, $\cosh(\alpha + i\beta)$, $\tanh(\alpha + i\beta)$, $\tan^{-1}(\alpha + i\beta)$.

UNIT II: Logarithm of a complex number and Summation of Series

Logarithm of a complex number – Summation of trigonometric Series – When angles are in A.P. – method of Differences.

UNIT III: Differentiation of Scalar and Vector Point Functions

Scalar and Vector point functions – Level Surfaces – Directional derivative of a Scalar Point function – Gradient of a Scalar Point function – Summation notation for gradient – Gradient of *f(r)* – Divergence and curl of a vector point function – Summation notation for divergence and curl – Laplacian differential operator – Other differential operators – Divergence and curl of a gradient – Divergence and curl of a curl – Problems.

UNIT IV: Integration of Scalar and Vector Point Functions

Line integrals – Independence of path of integration – Conservative field and scalar potential – Line integral of a conservative vector – Surface integrals – Volume integrals – Cylindrical and Spherical polar coordinates – Problems.

UNIT V: Integral Theorems

Integral theorems – Gauss" Divergence theorem – Integral theorems derived from the Divergence theorem – Green"s theorem in plane – Stoke"s theorem – Integral theorems

derived from Stoke"s theorem – Operational meanings of in terms of surface integrals – Problems.

TEXT BOOKS

1. S.Narayanan and T.K .Manicavachagom Pillay, *Trigonometry*, S. Viswanathan Publishers, 2009.

2. P. Duraipandian and Kayalal Pachaiappa, *Vector Analysis*, S.Chand & Co., 2014.

REFERENCE BOOKS

1. **M.L.Khanna**, *Trigonometry,* Jai Prakash Nath & Co., Educational Publisher, 14th Edition, 1993.

2. **M.D.Raisinghania**, **H.C.Saxena**, **H.K.Dass**, *Simplified Course in Trigonometry,* S.Chand and Company Ltd., 2002.

3. **M.D**. **Raisinghania,** *Vector Calculus*, S.Chand and Company Ltd., 3rd Edition, 1997.

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19UMAASC04	**MICRO ECONOMICS**	L	T	P	C
		3	1	0	4

Objectives: To study the concept and nature of economics, to study the utility concept and cost and revenue, to learn Concept of market structure

Unit-I: DEFENITION AND SCOPE OF ECONOMICS

Definitions of microeconomics and macroeconomics -Differences between Micro and Macroeconomics – Basic economic problems – economic system.

Unit-II: UTILITY ANALYSIS

Characteristics of human wants –Types of wants- Utility analysis –Total utility and marginal utility – Law of diminishing Marginal utility- Consumer‟s Surplus – Indifference curve analysis.

Unit-III: DEMAND AND SUPPLY

Definition of demand –Law of demand- Assumptions of the law of demand- Demand curve – Factors influencing demand – Changes in demand- Definition of supply- Law of supply- Supply curve- Factors influencing supply - Changes in supply - Equilibrium price- Price discrimination-Pricing strategies- Multiple pricing.

Unit-IV: COST AND REVENUE

Definition of cost – Fixed cost –Variable cost- Total cost- Definitions of short and long run– Average cost and marginal cost- revenue- Total revenue and marginal revenue – Profit – Features- Price and output determination – Interaction of demand and supply - Market period – Short and long run – Impact of tax and subsidies.

Unit-V: MARKET STRUCTURE

Profit – Features- Price and output determination – Interaction of demand and

supply - Market period – Short and long run – Impact of tax and subsidies.

Text Book:
 S. Sankaran, Micro Economics, Margham Publications, Chennai, 2014.

References:
1. Dr.Deepashree, Micro Economic theory and Applications, Volume I and Volume II, Sixth edition, Sultan Chand & Sons, New Delhi, 2005.
2. H.S.Agarwal, Micro Economic Theory, Seventh edition, Ane Books India, New Delhi, 2005.
3. S.Sankaran , Micro Economics, Seventh edition, Margham Publications, Chennai, 2004.
4 R.Cauvery, U.K.Sudhanayak, M.Grija, N. Kirupalani and R.Meenakshi, Micro Economic Theory, S. Chand & Company Limited New Delhi, 2004.
4. K.K. Dewett, Modern Economic Theory, 22nd Revised enlarged edition, S.Chand & Companies, New Delhi, 2005.

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		L	T	P	C
19UMAASC05	**DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS**	5	1	0	5

Unit – I:

Ordinary Differential Equations – Second order Differential Equations with constant co–efficients – Particular Integrals of the form $e^{ax}V$, where V is of the form x, x_2, sinax, cosax, xsinax and xcosax.

Unit – II

Second order differential Equations with variable co efficients- both homogeneous linear equations and homogeneous non - linear equations.

Unit – III: Partial Differential Equations

Partial Differential Equations –Definition – Complete solution, Singular solution and general solution – Solution of equations of standard types f(p,q)=0, f(x,p,q)=0, f(y,p,q)=0, f(z,p,q)=0 and f_1(x,p)= f_2(y,q) – Clairaut‟s form – Lagrange‟s equation Pp+Qq=R.

Unit – IV

Laplace Transforms – Definition – Laplace transforms of Standard functions – Elementary theorems – Problems.

Unit – V

Inverse Laplace transforms – Standard formulae – Elementary Theorems – Applications to Second order linear differential equation (Problems with only one differential equation).

Text Books

1. T.K. ManickavasagamPillai and S. Narayanan, Calculus, Vijay Nicole Imprints Pvt. Ltd., Chennai, 2004.

2. Dr.P.R. Vittal, Differential Equations, Fourier Series and Analytical Solid Geometry, Margham Publications, 24, Rameswaram Road, T. Nagar, Chennai – 600 017, 2000.

Reference Books

1. S.Narayanan& T.K. ManichavasagamPillay, Differential equations and its applications, S.Viswanathan PVT. LTD, 2001.

2. M.K. Venkatraman, Engineering Mathematics, National Publishing company, Chennai, 2008.

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19UMAASC06	**BASIC ACCOUNTING CONCEPTS**	L	T	P	C
		5	1	0	4

Objectives: To study the concepts of accounting and its recording procedures, to study the basics of financial statements and ration analysis

Unit – I: Accounting

Concepts - Types of accounts - Comparisons: Financial, Management and Cost accounting – advantages and limitations of financial, management and cost accounting.

Unit – II: Accounting records and systems

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

Unit – III: Accounting mechanics II

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

Unit – IV: Cash book and Subsidiary books

Single column cash book -Double column cash book -Three column cash book – Petty cash book –Purchase book – Sales book - Purchase Return book- Sales Return book

Unit – V: Bank reconciliation statement

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

Text:

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

Reference:

Jawaharlal and SeemaSrivastava "Financial accounting"

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19UMAASC07	**SAMPLING THEORY**	L	T	P	C
		5	1	0	4

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

Unit I: Sampling

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

Unit II :

Testing of Hypothesis – Test of Significance of Large Samples – Sampling of

Attribute – 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 foe difference of means – test of significance of standard deviation

Unit III:

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

Unit IV:

Students "t" Distribution introduction – Deviation of Student"s "t" Distribution – Application of t-test – t-test for single mean – t-test for difference of means

Unit V:

F- Statistics – Derivation of F Distribution – Constants of F Distribution – Application of F Distribution – F Test for equality of population variance – Relationship between t and F distribution – Relation between F and χ_2 . Fisher"s Z distribution – MGF of Z distribution - Fisher"s Z transformation - Analysis of Variance

Text Book:

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

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

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

Unit V: Chapter 14 (14.5 – 14.8)

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19UMAASC08	**FINANCIAL MATHEMATICS-I**	L	T	P	C
		5	1	0	4

Objectives:

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

Unit I: Cash flow Model

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

Unit II: The Time Value of Money

Simple Interest, Compound Interest, Simple Discount, Interest Rates: Accumulation Factors – Principles of Consistency.

Unit III: Discounting and accumulating

Present Values– Accumulated values – The Basic Compound Interest Functions.

Unit IV: Level Annuities

Present Values – Payments Made in Arrear, Payment Made in Advance – Accumulations – Perpetuities.

Unit V: Investments

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

Text Books:

1. ActEd Study Material: Subject - CT1

2. Mathematical basis of life insurance – IC81 – Insurance Institute of India material

REFERENCE:

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

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19UMAASC09	**BASICS OF LIFE CONTINGENCIES**	L	T	P	C
		5	1	0	4

Objectives:

(i)   Define simple assurance and annuity contracts, and develop formulae for the means and variances of the present values of the payments under these contracts, assuming constant deterministic interest.

(ii)   Describe practical methods of evaluating expected values and variances of the simple contracts defined in objective (i).

(iii)   Describe and calculate net premiums and Gross premium of simple insurance contracts.

Unit I: Assurance Benefits

Introduction – Whole life assurance – Term Assurance- Pure endowment Assurance- Endowment Assurance – Commutation Functions Dx, Cx,Mx and Rx

Unit II: Annuity Benefits

Introduction – Whole life annuity (due and arrear)-Temporary annuity (Due and Arrear)-deferred whole life annuity- Variable life annuity-Increasing life annuity- Commutation functions Nx and Sx.

Unit III: Net Premiums for Assurance Plans

Natural premiums- Level Annual Premiums-Actuarial Notations-Mathematical expressions for level annual premium under various Assurance plans – Net Premiums- Problems on net Premiums.

Unit 4: Net Premiums for Annuity Plans

Actuarial Notations-Mathematical expressions for level annual premium under various Annuity plans – Net Premiums- Numerical Illustrations on net Premiums

Unit 5: Office Premiums

Introduction- Loading in premiums rates for expenses- Expression for office premiums – Bonus loading in premium rates-Consistency of premiums-Select premiums – Numerical illustrations on Office Premiums.

Text Book:

"Mathematical Basis of Life assurance" – IC -81 - Insurance Institute of India

Reference:

1.   "Actuarial Mathematics for Life Contingent Risks" – Author: David C. M. Dickson, Mary R. Hardy, Howard R. Waters
2.   Actuarial mathematics. Bowers, Newton L et al. – 2nd ed. – Society of Actuaries, 1997. xxvi, 753 pages. ISBN: 0 938959 46 8.
3.   Life contingencies. Neill, Alistair. – Heinemann, 1977. vii, 452 pages. ISBN 0 43491440 1.
4.   Life insurance mathematics. Gerber, Hans U. – 3rd edition – Springer. Swiss Association of Actuaries, 1997.217 pages. ISBN 3 540 62242 X.

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19UMAASC10	MORTALITY AND MARKOV CHAINS	L	T	P	C
		4	1	0	4

Unit I:

Definition of l_x, p_x, q_x, $_np_x$, $_nq_x$, $m/ _nq_x$, concept of force of mortality μ_x, Derivation of $_np_x$ in terms of μ_x ie, $_np_x$ = exp(-   ) – Laws of mortality.

Unit –II:

Future life time random variables T_x, K_x – Definitions of   and   in terms of expectations of K_x and T_x, Relation between e_x and e_{x+1} – Simple problems.

Unit III:

Select and ultimate lives – Select period – Definitions of $l_{[x]}$, $_np_{[x]}$,$_nq_{[x]}$ – Simple problems.

Unit IV:

Censoring mechanism – The Kaplan-Meier estimate – Simple problems – Integrated hazard function.

Unit V:

The Nelson – Aalen estimate – Relationship between the Kaplan – Meier and Nelson – Aalen estimates – Simple problems – Introduction to Markov chains – Definition with simple examples.

Text Books:

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

2. Models – IAI Material – CT- 4 (Unit IV and V – Chapter 8)

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19UMAASC11	<u>ABSTRACT ALGEBRA - I</u>	L	T	P	C
		5	1	0	5

Unit I

Groups – definition and Examples – Subgroup – order of an element – centre of a group – Normalizer and centralizer. Product of two subgroups – order of HK – Intersection and union of subgroups.

Unit II

Cyclic groups – generators of a cyclic group – Number of generators of a cyclic groups – Cosets – Partitioning of a group by Cosets – Lagrange"s theorem – Euler"s theorem – Fermat"s theorem.

Unit III

Normal subgroups : Quotient groups – Group Homomorphis – Canonical homomorphism – kernel of a homomorphism – Isomorphism – Automorphism – Inner automorphism – Permutation groups – Cayley"s theorem.

Unit IV

Rings: Definition and examples – Types of rings – Elementary properties of a ring – Integral domain – Field – Sub rings – Subfields – Ideals – Principal ideal – quotient ring – Maximal and prime ideals - characteristic of a ring – PID – UFD.

Unit V

Homomorphism of rings – Isomorphism – kernel of a homomorphism –

Fundamental theorem – Field of quotients of an integral domain – polynomial rings – Division algorithm

Text Book:
Arumugam .S and Tangapandi Issac , Modern Algebra, Scitech publications Pvt. Ltd., 2015.

Books for Reference :

1. Anton .H and C. Rorres, Elementary Linear Algebra, 9th Edition, John Wiley and Sons, Inc., New York, 2005.

2. Manicavasagam Pillai .T.K and others, Modern Algebra, S. Viswanathan Publishers, Chennai, 1993.

3. Herstein .I.N, Topics in Algebra, Vikas Publishing Pvt. Ltd., New Delhi, 1995.

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19UMAASC12	**REAL ANALYSIS - I**	L	T	P	C
		5	1	0	5

Unit I: Real number system :
The field of axioms, the order axioms, the rational numbers, the irrational numbers, upper bounds, maximum element, least upper bound (supremum). The completeness axiom, absolute values, the triangle inequality. Cauchy – schwartz's inequality.

Unit II: Sequences
Bounded sequences – monotonic sequences – convergent sequences– divergent and oscillating sequences – The algebra of limits.

Unit III
Behaviour of monotonic sequences – Cauchy's first limit theorem – Cauchy's second limit theorem – Cesaro's theorem – subsequences - Cauchy sequence – Cauchy's general principle of convergence.

Unit IV
Series : Infinite series – nth term test – Comparison test – Kummer's test – D'Alemberls ratio test – Raabe's test - Gauss test – Root test – Canchy's

condensation test (without proof)

Unit V

Alternating series – Leibnitz's test - Tests for convergence of series of arbitrary terms – Power series – Taylor's series – Maclaurins series.

Text Books:

1. Arumugam .S and Thangapandi Issac – "sequences and series" New Gamma publishing House, Palayamkottai – 627 002.

2. Tom M. Apostol – Mathematical Analysis, II Edition, Narosa Publishing House, New Delhi (unit I)

Book for Reference :

1. Goldberg .R – Methods of Real Analysis, Oxford and IBH Publishing Co., New Delhi.

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19UMAASC13	**FINANCIAL MATHEMATICS - II**	L	T	P	C
		5	1	0	4

Objectives:

Define an equation of value, Describe how a loan may be repaid by regular installments of interest and capital

Unit I:

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

Unit II:

Equations of value:-The equation of value and the yield on a transaction- The theory -Solving for an unknown quantity -Solving for the amount of a payment (I or R)- Solving for the timing of a payment (n)- Solving for the interest rate (i)

Unit III:

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

calculation

Unit IV:

Calculating the interest and capital elements of the Loan schedule:-single
payment – series of payments –Forming the loan schedule -Consumer credit:
flat rates and Annual Percentage Rate

Unit V:

Project appraisal:- MWRR , TWRR, LIRR

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

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

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19UMAASC14	**ABSTRACT ALGEBRA - II**	L	T	P	C
		5	1	0	5

Unit I: Vector Spaces
Definition and examples – elementary properties – subspaces – linear
transformation – fundamental theorem of homomorphism.

Unit II

Span of a set – linear dependence and independence – basis and
dimension - theorems

Unit III

Rank and nullity Theorem – matrix of a linear transformation **Inner product
space :** Definition and examples – orthogonality – orthogonal complement –

Gram Schmidt orthognalisation process.

Unit IV: Matrices

Elementary transformation – inverse – rank – test for consistency – solving linear equations.

Unit V

Cayley Hamilton theorem – Applications of Cayley Hamilton theorem – Eigen values and Eigen vectors – Properties and problems.

Text Book:
   1. Arumugam & others – Modern Algebra

Books for Reference :

1. Shama J N and Vashistha A R "Linear Algebra" Krishna Prakash Nandir, 1981.

2. John B Fraleigh "A First Course in Abstract Algebra" 7th edition, Pearson, 2002.

3. Strang G "Introduction to Linear Algebra" 4th edition, Wellesly Cambridge Press, Wellesly, 2009.

4. Artin M "Abstract Algebra" 2nd edition, Pearson, 2011.

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19UMAASC15	**REAL ANALYSIS - II**	L	T	P	C
		5	1	0	5

Unit I
Metric spaces – Examples – bounded sets – open ball – open sets – subspaces – Interior of a set.

Unit II
Closed sets – closure – Limit points – Dense sets – complete metric space – Cantor‟s intersection theorem – Baire‟s Category Theorem.

Unit III

Continuous functions on metric spaces : Functions - continuous at a point on the real line – Functions - Continuous – uniform continuous in a metric space – Discontinuous function or R_1.

Unit IV

Connectedness and compactness : Connectedness – connected subset of R – connectedness and continuity – compact metric spaces – compact subset of R_1 – Heine Borel theorem.

Unit V: Riemann Integral :

Sets of measure zero – Existence of the Riemann integral – Derivatives – Rolle‟s theorem – Fundamental theorem of Calculus – Mean   value theorem – Cauchy‟s mean value theorem – Taylor‟s theorem.

Text Books:

Arumugam & Others – Modern Analysis

* Malic .S.C – Mathematical Analysis, Wiley Eastern Limited, New Delhi.

Books for Reference :

1. Tom .M. Apostal – Mathematical Analysis, II Edition,
   Narosa Publishing House, New Delhi (Unit I) (1997)
2. Goldberg .R – Methods of Real Analysis Oxford and IBH Publishing
   Co. New Delhi (200)
3. Viswanath Naik .K – Real Analysis, Emerald Publishers, Chennai.
4. Malic .S.C and Savitha Arora (1991) - Mathematical Analysis, Wiley
   Eastern Limited, New Delhi.
5. Berberian .S.K – First course in Real Analysis, Springer Verlag,
   New York.

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19UMAASC16	**COMPLEX ANALYSIS**	L	T	P	C
		5	1	0	5

Unit I: Analytic functions

Functions of a complex variable – Derivatives – Cauchy – Riemann equations – sufficient conditions – Polar form – Analytic functions – Harmonic functions.

Unit II: Integrals

Definite integrals – Contours – Cauchy – Goursat theorem – antiderivatives and independence of path – Cauchy Integral formula – Morera's theorem.

Unit III: Series

Taylor's series – Examples – Laurent's series – Zeros of analytic functions – Residues – Residue theorem – Principal part of functions – Residues at poles.

Unit IV: Evaluation of Integrals

Evaluation of improper real integrals – improper integrals involving sines and cosines – Definite integrals involving sines and coines.

Unit V: Transformations

Conformal mappings – basic properties – Bilinear maps – fixed points Applications

Text Book :
    Arumugam .S and T. Issac –"Complex Analysis" – Scitech Publishing House – Chennai.

Books for Reference :

1. R.V. Churchill and J.W. Brown, Complex variables and Applications, 4th Edition, McGraw Hill International Editions, 2018.

2. Ponnuswamy .S – "Foundations of Complex Analysis" Narosa Publication House, New Delhi, 2nd Edition, 2005.

3. Duraipandian .P and Lakshmi Duraipandian – "Complex Analysis" – Emerald Publications, Chennai, 2001.

4. Shakarchi .R, Problems and solutions of Complex Analysis. Springer – Verlag, New York, 1999.

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PART - III

ELECTIVE COURSES SYLLABUS

19UMAASE01	**LIFE INSURANCE AND GENERAL INSURANCE**	L	T	P	C
		4	1	0	3

Objectives:

To understand the concepts of risk and its types, to learn insurance market and its contracts

Unit I: The concept of insurance and its evolution

Concept of insurance – Insurance (evolved and works) – Types of insurance – Importance of insurance industry - The Business of Insurance: how risk is managed by individuals and insurers – Premium – Importance of reinsurance- Role of insurance in economic and social development.

Unit II: The insurance contract

Introduction – Insurable interest – Principle of indemnity – Subrogation and contribution – Utmost good faith- Proximate cause.

Unit III: Life insurance products

Traditional products – Linked products – Annuities and group policies.

Unit IV: General Insurance

Concept and scope – Nationalization of general Insurance in India in 1972 structure of General Insurance in India –Privatization and Globalization of General Insurance in India.

Unit IV: Types of General Insurance

Fire insurance – Definition – Causes of fire – Essential characteristics of fire insurance contracts – Procedures – Rate fixation – Kind of fire insurance policies – Policy conditions - Claim settlement.

Text Book:

1. "Principles of Insurance" – IC 01 – III.

Reference:

1. Dorfman S. Mark, introduction to risk management and insurance Prentice hall India 2005
2. George E. Rejda, Principles of Risk Management and Insurance.

3. Emmett J. Vaughan, Therese M. Vaughan, Essentials of Risk Management and Insurance
4. Risk management by HullEdition 2002 Jr., C. Arthur C Williams, Peter C Young, Michael L. Smith "Risk Management & Insurance"

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19UMAASE02	**OPERATION RESEARCH**	L	T	P	C
		5	1	0	4

Unit - I

Introduction - Definition of O.R. - Scope, phases and Limitations of O.R. - Linear Programming Problem - Graphical Method - Definitions of bounded, unbounded and optimal solutions - procedure of solving LPP by graphical method - problems - Simplex technique - Definitions of Basic, non-basic variables - basic solutions - slack variables and optimal solution, simplex procedure of solving LPP - Problems.

Unit – II

Introduction- Balanced and unbalanced T.P, Feasible solution- Basic feasible solution - Optimum solution - degeneracy in a T.P. - Mathematical formulation - North West Corner rule - Vogell'sapproximation method (unit penalty method) Method of Matrix minima (Least cost Method) - problems-algorithm of Optimality test (Modi Method) - Problems. Introduction - Definition of Assignment problem, balanced and unbalanced assignment problem -restrictions on assignment problem - Mathematical formulation - formulation and solution of an assignment problem (Hungarian method) - degeneracy in an assignment problem – Problems.

Unit – III

Introduction - Definition - Basic assumptions - n jobs to be operated on two machines - problems - n-jobs to be operated on three machines - problems - n-jobs to be operated on m machines - problems . Definition of Inventory models-Type of inventory models: (i) Uniform rate of demand, infinite rate of production with no shortage (ii) Uniform rate of demand, finite rate of replacement with no shortage Book Works - Problems.

Unit – IV

Definitions -Newspaper boy problem - Inventory model with one and more price break problems. Introduction- definition of steady state, transient state and queue discipline, characteristics of a queuing model - Applications of queuing model - Little's formula - Classification of queues - Poisson process -properties of Poisson process. Models(i) (M/M/1): (∞ /FCFS) (ii) (M/M/1) : (N/FCFS) (iii) (M/M/S) : (∞ /FCFS) - formulas and problems only.

Unit - V

Introduction - definition of network, event, activity, Three time estimates (optimistic, pessimistic & most likely), critical path, total float and free float - difference between CPM and PERT – Problems.

Text Book

1. P.K. Gupta, Manmohan and KantiSwarup, Operations Research, 9th edition, 2001, Sultan Chand &Sons, Chennai.

Reference Books

1. CKMustafi, Operations Research, Fourth Edition, New Age International Publishers

2. P.K.Gupta and D.S. Hira, Operations Research, 2th edition, 1986, S Chand & Co, New Delhi.

3. S. Kalavathy, Operations Research, 2nd edition -2002, Publishing House Pvt. Limited,New Delhi.

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19UMAASE03	**TIME SERIES AND FORECASTING**	L	T	P	C
		5	1	0	4

Objective: The students will be able to understand time series models and apply them in forecasting.

UNIT I   **15 Hrs.**

Exploratory Time Series Analysis: Forecasting trend and seasonality based on smoothing. Methods of Exponential and moving average smoothing; Types and implications of interventions; Outliers, additive and innovational outliers, procedure for detecting outliers

UNIT II   **15 Hrs.**

Stationary Stochastic models: Weak and strong stationarity, Deseasonalising and detrending an observed time series, Auto-covariance, autocorrelation function (ACF), partial auto correlation function (PACF) and their properties, Conditions for stationarity and invertibility,

UNIT III   **15 Hrs.**

Models for Time Series: Time series data, Trend, seasonality, cycles and residuals, Stationary, White noise processes, Autoregressive (AR), Moving Average (MA), Autoregressive and Moving Average (ARMA) and Autoregressive Integrated Moving Average (ARIMA) processes, Choice of AR and MA periods

UNIT IV   **15 Hrs.**

Spectral analysis and decomposition: Spectral analysis of weakly stationary process, Periodogram and correlogramanalysis, Spectral decomposition of weakly AR process and representation as a one-sided MAprocess – necessary and sufficient conditions, implication in prediction problems.

UNIT V   **15 Hrs.**

Modeling Seasonal Time Series: Seasonal ARIMA models, estimation and forecasting, Fitting ARIMA models with Box-Jenkins procedure, Identification, Estimation, Verification, Test for white noise, Forecasting with ARMA models.

Text Books

1. Nicholas T. Thomopoulos, *Applied Forecasting Methods*, Prentice Hall, 1980
2. George E. P. Box, Gwilym M. Jenkins, Gregory C. Reinsel, Greta M. Ljung, *TimeSeries Analysis-Forecasting and Control*, 5th Edition, ISBN: 978-1-118-67502, Wiley, 2015.
3. Peter J. Brockwell Richard A. Davis, *Introduction to Time Series andForecasting*, 2nd Edition, Springer, 2002.

4. Douglas C. Montgomery, Lynwood A. Johnson and John S. Gardiner, *Forecasting and Time Series Analysis*, McGraw Hill, 1977.

Reference Books

1. Chatfield C, TheAnalysisofTimeSeries:TheoryandPractice,5th Edition, Chapman and Hall,1996.
2. Nachane D.M, Econometrics: Theoretical Foundations and Empirical Perspective, Oxford University Press, 2006
3. Diggle, P.J, Time Series: A Biostatistical Introduction, Oxford University Press, 1990.
4. Tsay, R., Analysis of Financial Time Series, Wiley Series, 2002.

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		L	T	P	C
19UMAASE04	**INSURANCE UNDERWRITING AND RISK** **MANAGEMENT**	5	1	0	4

Unit I:

Risk management in insurance – Meaning of Risk – Types of Risk – Objective risk - Risk management – Risk management Strategies - Risk management process- Risk financing.

Unit II: **Financial Underwriting**:

Purpose of financial underwriting - Objectives of financial underwriting - Concept of Insurable interest & Insurable value - Personal Insurance Cover- Human Life Value.

Unit – III:

Role of surveyors in non-life insurance – Operational risks – Disaster risk

financing – Non insurance transfers.

Unit – IV:

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

Unit – V:

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

Text Book:

Elements of Insurance by Dr E. Dharmaraj, SIMERS Publication

Reference:

Reinsurance management IC- 85 by III.

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19UMAASE05	**FIANANCIAL MANAGEMENT**	L	T	P	C
		5	1	0	4

UNIT – 1: Financial Functions of Management

Introduction - Meaning – Objectives- Profit maximisationVs wealth maximisation – Decision making in financial management – Indian Financial System.

UNIT – 2: Cost of capital

Meaning and concept – Classification – Traditional approach – Modigliani & Miller approach – Computation of cost of capital – Cost of debt- Cost of preference share capital – Cost of equity – Weighted average cost of capital.

UNIT – 3: Dividend Policy

Introduction – Forms of dividend –Dividend theories – Relevance concept as dividend – Irrelevance concept of Dividend

UNIT – 4: Risk of return and rates

Mean - Variance - Standard Deviation - Expected rate of return and risk - Beta Value - Capital Asset Pricing Model (CAPM)

UNIT – 5: Leverages

Meaning – Types – Operating Leverages - Financial Leverages - Combined Leverages

Text Book:

"Fundamentals of financial Management" by D Chandra Bose

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19UMAASE06	MATHEMATICAL MODELING	L	T	P	C
		5	1	0	4

Objectives: To introduce the basic concepts of modeling, to study the different mathematical models involving differential equations, graph theory etc.

Unit I:

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

Unit II:

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

Unit III:

Modeling through difference equations – Linear difference equation – Obtaining complementary function by use of matrices – Harrods model – cob-web model – Applications of actuarial science.

UNIT – IV:

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

Unit –V:

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

Text Book:

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

Unit I: Chapter 2   § 2.1 – 2.3, 2.4.2

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

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

Unit IV: Chapter 10 – CT1

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

Reference Books

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

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PART - III

ALLIED COURSES SYLLABUS

19UMAASA01	**MATHEMATICAL STATISTICS - I**	L	T	P	C
		5	1	0	4

Objectives:

(i) Summarize the main features of a data set (exploratory data analysis).

(ii) Explain the concepts of probability.

(iii) Explain the concepts of random variable, probability distribution, distribution function, expected value, variance and higher moments, and calculate expected values and probabilities associated with the distributions of random variables.

Unit 1: Introduction:

Introduction-Meaning-Importance-Function-Limitation-Collection of Data - Objectives-Rules and types – Frequency distribution (discrete and continuous) – Frequency (class, two - way, cumulative) – Classification and Tabulation.

Unit 2: Diagrammatic and Graphical Representation:

Advantages-construction-rules-Diagram - Simple Bar Diagram – Multiple Bar Diagram – Clustered Bar Diagram - Line Diagram – Pie Chart – Graph histogram - Frequency (polygon, curve, ogive) – (time series, z curve, horizontal line, false base lines, component or band graph)

Unit 3: Measures of central tendency (Averages):

Introduction - Meaning – Definition-Functions – Characteristics – Arithmetic mean – Median – Mode – Geometric Mean - Harmonic Mean

Unit 4: Measures of Dispersion and skewness, kurtosis, moments:
Introduction – Meaning -Range – Mean Deviation - Quartile Deviation – Standard Deviation- Skewness - Kurtosis

Unit 5: Probability :

Introduction - History – Meaning – Mathematical properties- Permutation – Combination – Trial – Event- Sample space- Mutually exclusive cases-

Exhaustive events- Dependent and independent events- Simple and compound events -Measurement – Classical – Relative frequency theory – Limitations-Personalistic view of probability and axiomatic approach of probability – Addition and multiplication theorem – odds – practical problems

Text Book:

Dr P. Mariappan, Statistics for Scientific Solutions, New Century Book House [P] Ltd., 2008.

Unit I : Chapter 1 Sections -1.1, 1.5 chapter3- sections 3.1 to 3.4; 3.6 to 3.10
Unit-II: Chapter -3 section 3.12
Unit III: Chapter 4 [except sections 4.9 and 4.9]
Unit IV: Chapter 5 and chapter 6   Unit V: Chapter 8 Sections 8.1 to 8.3

Reference Book:

S.C. Gupta and **V.K. Kapoor**, "Fundamentals of Mathematics and statistics" by Sultan Chand and Sons Publishers, 2014.

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19UMAASA02	**MATHEMATICAL STATISTICS - II**	L	T	P	C
		5	1	0	4

Objective:

I. Define basic discrete Distributions.
II. Explain the concepts of independence, jointly distributed random variables and conditional distributions, and use generating functions to establish the distribution of linear combinations of independent random variables.
III. Explain the concepts of conditional expectation.

Unit I :

Baye"s Theorem and Problems – Random Variable – Distribution function – Properties of Distribution function – Discrete Random Variable – Probability Mass Function – Discrete Distribution function – Continuous Random Variable – Probability Density Function – Continuous distribution Function

Unit II :

Two dimensional random variable - Joint Probability Law – Joint Probability Mass Function – Joint Probability Distribution Function – Marginal Distribution Function - Joint Density Function - The Conditional Distribution Function – Stochastic Independence

Unit III: Mathematical Expectation and Generating Function (Basic Concepts only)

Mathematical Expectation – Expectation of a function of random variable – Addition theorem of Expectation – Multiplication theorem of Expectation – Expectation of Linear combination of Random variables – Covariance – Variance of a linear combination of Random Variables –Conditional expectation and conditional variance

Unit IV: Discrete Distribution:

Moment generating function, Introduction – Bernoulli distribution – Binomial Distribution – Poisson distribution.

Unit V: Continuous Distribution:

Uniform Distribution – Normal Distribution – Gamma Distribution.

Text Book:

S.C. Gupta and **V. K. Kapoor**, Fundamentals of Mathematical Statistics by S & Chand Publishers:

Unit I: Chapter   4&5- (4.2, 5.2, 5.4)

Unit II: Chapter   5 – (5.5.1 – 5.5.6)

Unit III: Chapter   6 – (6.1 – 6.6, 6.8, 6.9)

Unit IV: Chapter   7.1, 8.1-8.5

Unit V: Chapter   8 – (8.1 – 8.3)

Reference Books:

1. Dr P. Mariappan, Statistics for Scientific Solutions, New Century Book House [P] Ltd., 2008.

2. S.C.Gupta, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, 2016.

3. S.P. Gupta, Statistical Methods, Sultan Chand and Sons, 2016.

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19UMAASA03	PRACTICAL – „R" PROGRAMMING	L	T	P	C
		5	1	0	4

Objective: To make the students to
  I. be equipped with the professional competency through learning Free Open Source Software – R
  II. Create the database, visualizing and analyzing the data using R
  III. Make inferences through the results obtained

List of practicals – R (30 Hours)

1. Use R as a calculator using basic Commands in R

2. Data entry, manipulation and retrieval

3. Creating frequency and relative frequency distribution in R

4. Creating data frame, matrices

5. Descriptive statistics, Graphics - pie diagram, box plot, histogram, bar plot

6. Creating functions

7. To find mean, median, geometric mean, harmonic mean of numerical data and edit the output

8. To determine standard deviation, variance and checking the consistency of the given data and edit the output

9. Bivariate data- scatter plot, correlation co-efficient, fitting linear regression line and interpreting the result

10. Multiple linear regression models
11. Computation of probabilities in various distributions.(Binomial, Poisson, Normal)
12. Drawing the graph of probability mass and density functions
13. One and two sample„*t*" test and paired" test
14. One way and two way Analysis of Variance tests

1. **W. John Braun** and **Duncan J. Murdoch,** A First Course in Statistical Programming with R, Cambridge University Press, Newyork, 2007.
2. J H Maindonald, Using R for Data Analysis and Graphics: Introduction, Code and Commentary, *https://cran.r-project.org/doc/contrib/usingR.pdf*, 2008.
3. Kim Seefeld and Ernst Linder, Statistics Using R with Biological Examples, *https://cran.r-project.org/doc/contrib/Seefeld_StatsRBio.pdf*, online.

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| 19UMAASA04 | **PHYSICS - I** | L | T | P | C |
| | | 5 | 1 | 0 | 4 |

19UMAASA05	**PHYSICS - II**	L	T	P	C
		5	1	0	4

19UMAASA06

PRACTICAL - PHYSICS

		L	T	P	C
		3	1	1	2

PART - IV

SKILL BASSED ELECTIVE COURSE SYLLABUS

19UMAASS01	**GROUP INSURANCE**	L	T	P	C
		3	2	0	2

Objective:

Aim of this ~~Subject to give abrief introduction to various group Insurance~~ scheme available in Indian Financial Market.

Unit I : **Group Insurance**

Group Insurance - Segments of group schemes market – Origin and development of group schemes characteristics of groups.

Unit II: Group Underwriting

Group underwriting- rate making and experience rating adjustment.

Unit III: **Types Of Group Insurance In India**

Group Gratuity- Group Superannuation- GSLI- Group Credit Insurance - Group Insurance In Lieu Of EDLI.

Unit IV:

Group Insurance – Administration - Claims and Renewals- Reinsurance for Group Insurance.

Unit V: Social & Rural Insurance

Micro Insurance Concept-Micro Insurance Regulations-Social Group Insurance- Different Government Schemes For Weaker Sections- Rural Areas.

Text Book:

1. IC 83 of Insurance Institute of India.

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19UMAASS02	**LaTex Practical**	L	T	P	C
		2	1	2	2

LIST OF PRACTICALS

1. Type a Document in different alignments (Left, Right, Center, Justify).

2. Type a Letter for applying a job.

3. Type your own Bio – Data.

4. Draw a Table structure.

5. Type a given Mathematical expression using Differentiation, Integration and Trigonometry.

6. Type a given Mathematical expression using all expression.

7. Type a given expression using all inequalities.

8. Type of given Article.

9. Draw any picture and insert in LateX file.

10. Type a given Question paper

11. Convert one LateX file into power point presentation.

Text Books

1. David F Griffiths and Desmond J. Higham, Learning LaTex, SIAM (Society for Industrial and Applied Mathematics) Publishers, PhidelPhia, 1996.

Reference Books

1. Martin J. Erickson and Donald Bindner, A Student's Guide to the Study, Practice, and Tools of Modern Mathematics, CRC Press, Boca Raton, FL, 2011.
2. L Lamport LATEX: A Document Preparation System User‟s Guide and Reference Manual. Addison-Wesley, New York, second edition, 1994.

Note

➢ This paper should be handled and valued by the faculty of Mathematicsonly.

➢ Both Internal and External Examiners for University Practical Examinationshould be appointed from faculty of Mathematics only.

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19UMAASS03	RETIREMENT BENEFITS	L	T	P	C
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Objective:

Aim of this Subject to give abrief introduction to various

Retirement benefitsavailable in Indian Financial Market.

Unit I:Historical background to employee benefits in India

Provident funds - Superannuation - Gratuity schemes.

Unit II: Gratuity and Superannuation Schemes

Different ways of arranging schemes – Unfunded schemes and funded schemes

– Trustee administered and insured schemes.

UNIT III: Methods of costing

Past service benefits and future service benefits – annual

premium and single premium – method of costing, definite

funding and indefinite funding and controlled funding.

Unit IV:Legal aspects and taxation

Treatment of retirement provisions under

provident, gratuity andsuperannuation funds –

Documentation of Trust deeds and Rules.**Unit**

V: **Pension Products & Annuities**

Defined Benefit Pension Scheme - Defined Contribution

Pension Scheme - Classification Of Annuities - Life Annuity -

Annuity Certain -Annuity Options - Fixed Annuity - Variable

Annuity - Linked Annuity

Text Book:

IC 83 of Insurance Institute of India.

COURSE : NMEC – II

SEMESTER : III

PAPER CODE : 19UMAASN01

TITLE OF THE PAPER : BASIC STATISTICS

Learning Objectives:

➢To enable the students to understand the basic concepts of statistics, collection of data, presentation of data and analysis of data.

➢ To acquire knowledge of statistics and its scope and importance in various areas such as Medical, Engineering, Agricultural and Social Sciences etc.,

Course Outcomes:

The students will be able to:

➢ Distinguish between population and sample. ➢ Know the concepts of random sampling and non-random sampling.

➢ Frame a questionnaire and collect primary and secondary data. ➢ Analyze statistical data and draw graphs, histograms, frequency polygons and Ogives.

UNIT – I

Introduction Meaning and Scope Statistics – Definition – Scope – Limitations – Population and Sample – Concepts of Random sampling and Non-random sampling – Basic concepts only.

UNIT – II   Collection of Data

Primary and Secondary data – Methods of collecting primary and secondary data - sources of data – Preparation of Questionnaire and Schedule.

UNIT – III   Presentation of Data

Classification of data – Types – Frequency distributions for discrete and continuous data – Construction of tables with one, two factors of classification.

UNIT – IV   Diagrammatic Representation of Data

Bar Diagrams: Types of one dimensional and two dimensional bar diagrams - Pie-diagrams – Uses.

UNIT – V   Graphical Representation of Statistical Data

Histogram – Frequency Polygon – Frequency curve and Cumulative frequency curve – Ogive curves – Lorenz curve – Uses.

Books for Reference:

1. Gupta. S. P. (2001), Statistical methods, Sultan Chand & Company Ltd., New Delhi.

2. Pillai. R. S. N. And Bagavathi. V. (2005), Statistics, S. Chand & Company Ltd., New Delhi.

3. Sancheti. D. C. and Kapoor. V. K, Statistics (7th Edition), Sultan Chand & Sons, New Delhi.

4. Arora P. N, Comprehensive Statistical Methods, Sultan Chand & Sons, New Delhi.

5. Agarwal B. L, Basic Statistics, Wiley Eastern Ltd., Publishers, New Delhi.

6. Vittal P. R, Business Statistics, Margham Publications, Chennai.

7. Shukla M. C and Gulshan S. S, Statistics, Sultan Chand & Sons, New Delhi.

8. Simpson G and Kafka F, Basic Statistics, Oxford and IBH, Calcutta.

9. Freud J. E, Modern Elementary Statistics, Prentice Hall of India, New Delhi.

10. Saxena H. C (1983), Elementary Statistics, Sultan Chand & Sons, New Delhi.

Web Links: ➢https://www.tutorialspoint.com/statistics/

➢https://www.emathzone.com/tutorials/basic-statistics/collection-of-statistical-data.html

COURSE	:	NMEC – II

COURSE : **NMEC – II**

SEMESTER : **IV**

PAPER CODE : **19UMAASN02**

TITLE OF THE PAPER : **QUANTITATIVE APTITUDE**

COURSE OBJECTIVE

- To enhance the problem-solving skills.

- To improve the basic mathematical skills to help students who are preparing for any type of competitive examinations.

- To develop knowledge in practicing quantitative aptitude objective type question and answer in individual for competitive exams, entrance exams and interviews.

COURSE OUTCOME

After completion of this course, Students will be able to

1. Make sense of problems, develop strategies to find solutions and persevere in solving them.

2. Use appropriate technology in a given context.

3. Critique and evaluate quantitative arguments that utilize mathematics, statistical and quantitative information.

4. Solve problems in numbers, decimal fractions, square root and cube roots.

UNIT – I

Numbers, H.C.F. and L.C.M. of Numbers.

UNIT – II

Decimal Fractions , Square Roots and Cube Roots.

UNIT – III

Averages and Problems on Ages.

UNIT – IV

Surds and Indices, Percentages

UNIT – V

Ratio and proportion, Chain Rule

TEXT BOOK:

1. Dr. R.S. Aggarwal, Quantitative Aptitude, S. Chand and Company Ltd., New Delhi,Reprint 2013.

REFERENCE BOOK:

1. Abhijit Guha, Quantitative Aptitude Tata McGraw Hill Publishing Company Limited.,New Delhi. Reprint 2005

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