

## THIRUVALLUVAR UNIVERSITY

### BACHELOR OF SCIENCE

### B.Sc. MATHEMATICS

### DEGREE COURSE

### CBCS PATTERN

(With effect from 2012 - 2013)

### The Course of Study and the Scheme of Examinations

S.NO	Part	Study Components		Ins. hrs /week	Credit	Title of the Paper	Maximum Marks		
		Course Title					CIA	Uni. Exam	Total
<b>SEMESTER I</b>									
1	I	Language	Paper-1	6	4	Tamil/Other Languages	25	75	100
2	II	English	Paper-1	6	4	English	25	75	100
3	III	Core Theory	Paper-1	5	3	Algebra	25	75	100
4	III	Core Theory	Paper-2	4	3	Trigonometry	25	75	100
5	III	ALLIED -1	Paper-1	7	4	<b>(to choose 1 out of 4)</b> (For non practical Allied subjects only) (or)	25	75	100
6	III	ALLIED-1 (Theory)	Paper -1	4	4	<b>(to choose 1 out of 4)</b> (For practical Allied subjects)	15	60	75
		ALLIED-1 (Practical)		3	0				
7	IV	Environ. Studies		2	2	Environmental Studies	10	40	50
				<b>30</b>	<b>20</b>		<b>135</b>	<b>415</b>	<b>550</b>
<b>SEMESTER II</b>									
8	I	Language	Paper-2	6	4	Tamil/Other Languages	25	75	100
9	II	English	Paper-2	4	4	English	25	75	100
10	III	Core Theory	Paper-3	5	3	Calculus	25	75	100
11	III	Core Theory	Paper-4	4	3	Analytical Geometry	25	75	100
12	III	ALLIED-1	Paper-2	7	6	<b>(to choose 1 out of 4)</b> (For non practical Allied subjects only) (or)	25	75	100
13	III	ALLIED-1 (Theory)	Paper-2 Practical-1	4	4	<b>(to choose 1 out of 4)</b> (For practical Allied subjects)	15	60	75
		ALLIED-1 (Practical)		3	2		10	40	50
14	IV	Value Education		2	2	Value Education	10	40	50
15	IV	Soft Skill		2	1	Soft Skill	10	40	50
				<b>30</b>	<b>23</b>		<b>145</b>	<b>455</b>	<b>600</b>

**B.Sc. Mathematics: Syllabus (CBCS)**

SEMESTER III							CIA	Uni. Exam	Total
16	I	Language	Paper-3	6	4	Tamil/Other Languages	25	75	100
17	II	English	Paper-3	6	4	English	25	75	100
18	III	Core Theory	Paper-5	6	4	Differential Equations	25	75	100
19	III	ALLIED-2	Paper-3	7	4	<b>(to choose 1 out of 4)</b> (For non practical Allied subjects only) (or)	25	75	100
20	III	ALLIED-2 (Theory)	Paper-3	4	4	<b>(to choose 1 out of 4)</b> (For practical Allied subjects only)	15	60	75
		ALLIED-2 (Practical)		3	0				
21	IV	Skill based Subject	Paper-1	3	3	Mathematics for competitive Examinations	15	60	75
22	IV	Non-major elective	Paper-1	2	2	Basic Mathematics	10	40	50
				<b>30</b>	<b>21</b>		<b>125</b>	<b>400</b>	<b>525</b>
SEMESTER IV							CIA	Uni. Exam	Total
23	I	Language	Paper-4	6	4	Tamil/Other Languages	25	75	100
24	II	English	Paper-4	6	4	English	25	75	100
25	III	Core Theory	Paper-6	6	4	Vector Analysis and <b>Fourier analysis</b>	25	75	100
26	III	ALLIED-2	Paper-4	7	6	<b>(to choose 1 out of 4)</b> (For non practical Allied subjects only) (or)	25	75	100
27	III	ALLIED-2 (Theory)	Paper-4	4	4	<b>(to choose 1 out of 4)</b> (For practical Allied subjects only)	15	60	75
		ALLIED-2 (Practical)	Practical-2	3	2		10	40	50
28	IV	Skill based Subject	Paper-2	3	3	Linear Programming	15	60	75
29	IV	Non-major elective	Paper-2	2	2	Foundation Mathematics for Competitive Examination	10	40	50
				<b>30</b>	<b>23</b>		<b>125</b>	<b>400</b>	<b>525</b>
SEMESTER V							CIA	Uni. Exam	Total
30	III	Core Theory	Paper-7	5	4	Abstract Algebra	25	75	100
31	III	Core Theory	Paper-8	5	4	Real Analysis I	25	75	100
32	III	Core Theory	Paper-9	5	4	Complex Analysis-I	25	75	100
33	III	Core Theory	Paper-10	5	4	Statics	25	75	100
34	III	Core Theory	Paper-11	4	4	Dynamics	25	75	100
35	III	Elective	Paper-1	3	3	<b>(to choose 1 out of 2)</b> A. Graph Theory B. Astronomy	25	75	100
36	IV	Skill based Subject	Paper-3	3	3	Quantitative Techniques	15	60	75
				<b>30</b>	<b>26</b>		<b>165</b>	<b>510</b>	<b>675</b>

**B.Sc. Mathematics: Syllabus (CBCS)**

SEMESTER VI							CIA	Uni. Exam	Total
37	III	Core Theory	Paper-12	5	4	Linear Algebra	25	75	100
38	III	Core Theory	Paper-13	5	4	Real Analysis II	25	75	100
39	III	Core Theory	Paper-14	5	4	Complex Analysis II	25	75	100
40	III	Core Theory	Paper-15	3	3	Programming in C Language	15	60	75
			Practical	3	2	Practical in C Language	10	15	25
41	III	Elective	Paper-2	3	3	(to choose 1 out of 2) A. Operations Research B. Calculus of finite differences & Numerical Methods. (to be chosen only those students who have not taken numerical methods as allied subject)	25	75	100
42	III	Elective	Paper-3	3	3	(to choose 1 out of 2) A. Special functions B. Fuzzy Mathematics.	25	75	100
43	IV	Skill based Subject	Paper-4	3	3	Fundamentals of Applied Mathematics	15	60	75
44	V	Extension Activities		0	1		50	0	50
<b>Total</b>				<b>30</b>	<b>27</b>		<b>215</b>	<b>510</b>	<b>725</b>

Part	Subject	Papers	Credit	Total credits	Marks	Total marks
Part I	Languages	4	4	16	100	400
Part II	English	4	4	16	100	400
Part III	Allied (Odd Sem)	2	4	8	75	150
	Allied (Even Sem)	2	4	8	75	150
	Allied -Prac(Even Sem)	2	2	4	50	100
	Electives	3	3	9	100	300
	Core	15	(3-7)	57	100	1500
Part IV	Env. Science	1	2	2	50	50
	Soft skill)	1	1	1	50	50
	Value Education	1	2	2	50	50
	Lang. & Others/NME	2	2	4	50	100
	Skill Based	4	3	12	75	300
Part V	Extension	1	1	1	50	50
	<b>Total</b>	<b>42</b>		<b>140</b>		<b>3600</b>

**THIRUVALLUVAR UNIVERSITY**

**B.Sc. MATHEMATICS**

**SYLLABUS**

**CBCS PATTERN**

**(For the candidates admitted from 2012-2013)**

**SEMESTER I**

**PAPER - 1**

**ALGEBRA**

**Objectives**

In this Course students are exposed to topics like Theory of Equations, Summation of Series, Matrices, Continued Fractions and Elementary Number Theory. The stress is on the development of problem solving skills.

**UNIT-I: THEORY OF EQUATIONS**

Polynomial Equations - Symmetric Functions of roots in terms of Coefficients - Sum of r-th powers of roots - Reciprocal Equations - Transformation of Equations.

**UNIT-II: THEORY OF EQUATIONS (Contd...)**

Descartes Rule of Signs - Approximate Solutions of Polynomials by Horner's method - Newton - Raphson method of Solution of a Cubic Polynomial.

**UNIT-III: SUMMATION OF SERIES**

Summation of series using Binomial - Exponential and Logarithmic series (Theorems without proofs) - Approximation using Binomial & Exponential series.

**UNIT-IV: MATRICES**

Symmetric - Skew symmetric, - Hermitian - Skew Hermitian - Orthogonal and Unitary Matrices - Cayley-Hamilton Theorem (without proof) - Eigen Values - Eigen Vectors—Similar Matrices - Diagonalisation of a Matrix.

**UNIT-V: ELEMENTARY NUMBER THEORY**

Prime Number - Composite Number - Decomposition of a Composite Number as a Product of Primes uniquely (without proof) - Divisors of a Positive Integer - Congruence Modulo  $n$  - Euler Function (without Proof) - Highest Power of a Prime Number  $p$  contained in  $n!$  - Fermat's and Wilson's Theorems (statements only) - simple problems.

**Recommended Texts**

P.Kandasamy, K.Thilagavathy (2004), Mathematics  
for B.Sc. Vol-I, II, III & IV, S.Chand & Company Ltd., New Delhi-55.

**Reference Books**

1. T.K.Manicavachagom Pillay, T.Natarajan and K.S.Ganapathy. (2004) *Algebra*, Volume I & II S.Viswanathan Printers & Publishers Pvt. Ltd. Chennai.
2. S.Arumugam (2003) *Algebra*. New Gamma Publishing House, Palayamkottai.
3. A.Singaravelu (2003) *Algebra and Trigonometry*, Vol.-I & II Meenakshi Agency, Chennai.
4. S.Sudha(1998) *Algebra and Trigonometry*. Emerald Publishes, Chennai.

## PAPER - 2

### TRIGONOMETRY

#### Objectives

This course is a fundamental one for many courses of this Degree Programme. This covers topics on the expansions of trigonometric functions, hyperbolic functions, inverse circular, inverse hyperbolic functions and it aims to develop computational skills.

#### UNIT-I

Expansions of  $\cos n\theta$ ,  $\sin n\theta$  - Expansion of  $\tan n\theta$  in terms of  $\tan \theta$  - Expansion of  $\tan(A+B+C+\dots)$  - Formation of Equations.

Chapter III section 1 to 3

#### UNIT-II

Powers of sines and cosines of  $\theta$  in terms of functions of multiples of  $\theta$  - expansions of  $\sin \theta$  and  $\cos \theta$  in a series of ascending powers of  $\theta$  - Expansion of Inverse Circular Functions.

Chapter III section 4 and 5

#### UNIT-III: Hyperbolic Functions

Definition – Relation between Hyperbolic Functions - Inverse Hyperbolic Functions.

Chapter IV sections 1 to 2.3

#### UNIT-IV

Resolution into Factors - simple problems only - DeMoivre's Property on the Circle and Cote's Property on the Circle. Logarithm of complex quantities.

Chapter V sections 2 and 3(Problems only)

Chapter V sections 4, 4.1, 4.2, 5, 5.1, 5.2...

#### UNIT-V

Summation of Trigonometric Series: When the angles are in A.P, C+iS method of summation - Method of Differences - Gregory Series - Euler Series.

Chapter VI section 1, 2, 3, 3.1, 3.2.

#### Recommended Text

1. S.Narayanan and T.K.Manicavachagom Pillay (2004) *Calculus*. S.Viswanathan Printers & Publishers Pvt. Ltd. Chennai.

**Reference Books**

1. P.Kandasamy, K.Thilagavathy (2004), *Mathematic for B.Sc. Vol.-I, II, III & IV*, S.Chand & Company Ltd., New Delhi-55.
2. S.Duraipandian and Laxmi Duraipandian (1984) *Trigonometry*. Emerald Publishers, Chennai.
3. B.S.Grewal. (2002) *Higher Engineering Mathematics*. Khanna Publishers. New Delhi.
4. S.L.Loney. (1982) *Plane Trigonometry*, Part II, Cambridge University Press, London.
5. A.Singaravelu (2003) *Algebra and Trigonometry*, Vol.-I Meenakshi Agency, Chennai.
6. P.R.Vittal. (2004) *Trigonometry*, Margham Publications, Chennai.

## **SEMESTER II**

### **PAPER - 3**

### **CALCULUS**

#### **Objectives**

The course introduces students to the fundamental principles, concepts and knowledge in the areas of Differential and Integral Calculus. This prepares the students to apply these fundamental concepts and working knowledge to other courses.

#### **UNIT-I**

Differential Calculus:  $n^{\text{th}}$  derivative - Leibnitz's theorem( Without proof) and its application - Jacobians - Total differential - maxima and minima functions of 2 & 3 independent variable, Lagrange's method (without proof), problems on this concepts.

#### **UNIT-II: Differential Calculus (Contd...)**

Polar coordinates – Angle between radius vector and tangent – Angle between two curves, Curvature, Radius of Curvature in Cartesian and Polar coordinates, p-r equation, Evolutes.

#### **UNIT-III: Differential Calculus (Contd...)**

Asymptotes: Methods (without proof) of finding asymptotes of rational algebraic curves with special cases.

#### **UNIT-IV: Integral Calculus**

Reduction formulae, Beta and Gamma Functions - Properties and Problems.

#### **UNIT-V: Integral Calculus (Contd...)**

Double Integrals - Change of order of Integration - Triple Integrals - Applications to Area, Surface Area and Volume.

#### **Recommended Text**

S.Narayanan and T.K.Manicavachagom Pillay (2004) *Calculus*. S.Viswanathan Printers & Publishers Pvt. Ltd. Chennai.



**Reference Books**

1. P.Kandasamy, K.Thilagavathy (2004), *Mathematic for B.Sc. Vol.-I, II, III & IV*, S.Chand & Company Ltd., New Delhi-55.
2. Shanti Narayan (2001) *Differential Calculus*. Shyamlal Charitable Trust, New Delhi.
3. Shanti Narayan (2001) *Integral Calculus*. S.Chand & Co. New Delhi.
4. S.Sudha (1998) *Calculus*. Emerald Publishers, Chennai.
5. G.B.Thomas and R.L.Finney. (1998) *Calculus and Analytic Geometry*, Addison Wesley (9<sup>th</sup> Edn.), Mass. (Indian Print)
6. P.R.Vittal. (2004) *Calculus*, Margham Publication, Chennai.

**PAPER - 4**

**ANALYTICAL GEOMETRY**

**Objectives**

Students are exposed to fundamental aspects of Two and Three Dimensional Analytical Geometry and it develops logical and systematic computational skills.

**UNIT-I: Two Dimensional Analytical Geometry: Conics**

Chord in terms of middle points - Pole, Polar.

**UNIT-II: Two Dimensional Analytical Geometry (Contd) Conics**

Conjugate Hyperbola, Conjugate Diameter for Ellipse and Hyperbola

**UNIT-III: Three Dimensional Analytical Geometry**

Planes and Straight lines

**UNIT-IV: Three Dimensional Analytical Geometry: Sphere**

Section of a Sphere by a Plane- Tangent Plane, Orthogonal Spheres.

**UNIT-V: Three Dimensional Analytical Geometry: Cone and Cylinder**

Equation of a Cone - Cone whose vertex is at the origin - Quadric Cone with the vertex at the origin - Right Circular Cone - Cylinder- Right Circular Cylinder- Equation of a Cylinder

**Recommended Text**

T.K.Manickavachagom Pillay & others. (2004) *Analytical Geometry* (Two & Three Dimensions)  
S.Viswanathan Printers & Publishers Pvt. Ltd. Chennai.

**Reference Books**

1. P.Duraipandian and Laxmi Duraipandian (1965) *Analytical Geometry-2D*, Asia Publishing company, Bombay
2. P.Duraipandian and Laxmi Duriapandian (1975) *Analytical Geometry-3 D*, Emerald Publishers, Chennai.
3. G.B.Thomas and R.L.Finney.(1998) *Calculus and Analytic Geometry*, Addison Wesley (9<sup>th</sup> Edn.), Mass. (Indian Print).
4. P.R.Vittal (2003) *Coordinate Geometry*. Margham Publishers, Chennai

## SEMESTER III

### PAPER - 5

## DIFFERENTIAL EQUATIONS

### Objectives

This course aims to provide logical skills in the formation of differential equations, to expose to different techniques of finding solutions to these equations and in addition stress is laid on the application of these equations in geometrical and physical problems.

### UNIT-I: Ordinary Linear Differential Equations

Bernoulli Equation – Exact Differential Equations – Equations Reducible to Exact Equations – Equations of First order and Higher degree: Equations solvable for  $p$ , Equation solvable for  $x$  and Equations Solvable for  $y$  – Clairaut's Equation.

### UNIT-II: Ordinary Linear Differential Equations [Contd...]

Method of Variation of Parameters – 2<sup>nd</sup> order Differential Equations with Constant Coefficients for finding the P.I's of the form  $e^{ax} V$ , where  $V$  is  $\sin(mx)$  or  $\cos(mx)$  and  $x^n$  – Equations reducible to Linear equations with constant coefficients – Cauchy's homogeneous Linear Equations – Legendre's Linear Equations – Linear Dependence of Solutions – Simultaneous Equations with Constant Coefficients.

### UNIT-III: Differential Equations of Other Types

Equations of form  $d^2y/dx^2 = f(x)$  – Equations of the form  $d^2y/dx^2=f(y)$  – Equations which do not contain  $y$  – Equations which do not contain  $x$  – Total Differential Equations Simultaneous Total Differential Equations – Equations of the form  $dx/P = dy/Q = dz/R$  – Method of Grouping.

### UNIT-IV: Laplace Transform

Transform-Inverse Transform – Properties – Application of Laplace Transform to solution of first and second order Linear Differential equations [with constant coefficients] and simultaneous Linear Differential Equations.

### UNIT-V: Partial Differential Equations

Formation of PDF – Complete Integral – Particular Integral – Singular Integral – equations Solvable by direct Integration – Linear Equations of the first order – Non-linear Equations of the first Order–Non-linear Equations of the first Order:

### Types:

$$\begin{aligned}f[p,q]&=0, \\f[x,p,q]&=0, f[y, p, q]=0, f(z, p, q)=0, \\f[x, q]&= f[y, p], \\z&= px+qy + f[p, q]\end{aligned}$$

### **Recommended Texts**

1. B.S.Grewal [2002] Higher Engineering Mathematics, Khanna Publishers, New Delhi.
2. Sheply L.Ross, [1984] Differential Equations, III Edition John Wiley & Sons, New York.

### **Reference Books**

1. M.D. Raisinghania, [2001] Ordinary and Partial Differential Equations, S.Chand and Co., New Delhi.
2. M.R.Spiegel [2005] Advanced mathematics for Engineers and Scientists, Tata McGraw Hill Edition, New Delhi.
3. M.R.Spiegel [2005] Laplace Transforms, Tata McGraw Hill Edition, New Delhi.
4. S.Sudha [2003] Differential Equations and Integral Transforms, Emerald Publishers, Chennai.
5. M.K.Venkataraman [1998] Higher Engineering Mathematics, III-B, National Publishing Co., Chennai.
6. P.r.Vittal [2004] Differential Equations and Laplace Transform, Margham Publications, Chennai.
7. P.Kandasamy, K.Thilagarathy [2004] Mathematics for B.Sc. Vol. III S.Chand & Co., Ltd., New Delhi-55.
8. S.Narayanan & T.K.Manickavazagapillai [2004] Calculus S.Viswanathan Printers & Publishers Pvt. Ltd., Chennai.

**SKILL BASED SUBJECT**

**PAPER - 1**

**MATHEMATICS FOR COMPETITIVE EXAMINATIONS**

**Objectives**

To introduce concepts of mathematics with emphasis on analytical ability and computational skill needed in competitive examinations.

**UNIT-I: Problems on General Arithmetic**

Ratio and proportions - Inverse ratio - properties (Addendo, subtrahendo, componendo & dividendo) - ratio of four numbers - increasing and decreasing order of fractions – Problems of ages.

Section 1.12 and 1.8

**UNIT-II**

Percentages - gain and loss percents - partnership problems .

Section 1.10, 1.11 and 1.13

**UNIT-III: Time, Distance and Work**

Time and distance- Time and work

Section 1.17 and 1.15

**UNIT-IV: Commercial Arithmetic:**

Simple interest- compound interest - shares and stocks.

Section 1.21, 1.22 and 1.29

**UNIT-V: Basic statistics**

Measures of central tendencies, mean, median, mode, G.M & H.M, error corrections, application, properties.

Measures of dispersion - Range, S.D, Q.D, percentiles and deciles applications

**Recommended Text**

1. I to IV units\_ Quantitative Aptitude - R.S. Aggarwal (S.Chand & Co - New Delhi 2008)
2. V unit Fundamentals of applied statistics – S.C. Gupta and V.K. Gupta

**Reference Books**

1. Quantitative Aptitude - R.S. Aggarwal (S.Chand & Co - New Delhi 2008)
2. Quantitative Aptitude for Competitive Examinations - Abhigit Guha (Tata McGraw - Hill Pub., Co., Ltd. New Delhi - III Edn.,)
3. Course in Mental Abilities and Quantitative Aptitude for Competitive Examinations - Edgar Thorpe (Tata McGraw - Hill Pub., Co., Ltd. New Delhi - II Edn.,)
4. Statistic, RSN Pillai and A. Bagavathi, S.Chand & Co.,
5. Elements of statistics, Sivadanu Pillai.
6. Algebra, Manickavachakam Pillai & Narayanan

**NON-MAJOR ELECTIVE**

**PAPER -1**

**BASIC MATHEMATICS**

**Objectives**

To introduce a few basic and elementary concepts of mathematics for other major students.

**UNIT-I: Sets**

Definition - Subsets - Power sets - Equality of sets - Finite and Infinite sets - Set operations - De-Morgan's laws - Distributive tables - Cartesian products.

**UNIT-II: Number system**

Binary, octal, hexadecimal numbers - conversion from one system to another system - addition and subtraction - one's complement.

**UNIT-III: Symbolic logics**

Logical statements - connectives - truth tables - tautologies operations - groups – (problems and simple properties only).

**UNIT-IV: Determinants**

Definition - properties (without proof) - application of determinants - Cramer's rule for the solution of a system of equations

**UNIT-V: Matrices**

Definition - types of matrices - operations on matrices - adjoint and inverse - applications - solving non-homogeneous equations.

**Recommended Texts**

1. Dr.M.K.Venkataraman & others, "Discrete mathematics and structures", The National Publishing Company, Madras.
2. Trembly J.P and Manohar.R "Discrete Mathematical Structures with applications to computer science" Tata McGraw - Hill Pub., Co., Ltd. New Delhi 2003.

**Reference Books**

1. P.R.Vittal "Algebra, Analytical Geometry and trigonometry" Margham Publications, Chennai.
2. Richard Johnsonbaugh, "Discrete Mathematics" fifth Edn., Pearson Education Asia, New Delhi 2002.

## SEMESTER-IV

### PAPER-6

## VECTOR ANALYSIS AND FOURIER ANALYSIS

### Objectives

This course covers the topics in vector and tensor calculus which are essential tools of modern applied mathematics. To develop deep understanding of key concepts followed by problems of applied nature. The portion on Fourier analysis will lead to post-graduate studies and research in pure as well as applied mathematics.

### UNIT-I: Differential Vector Calculus

Differentiation of a Vector - Geometrical Interpretation of the Derivative - Differentiation Formulae - Differentiation of dot and Cross Products - Partial Derivatives of Vectors - Differentials of Vectors.

### UNIT-II: Gradient, Divergence and Curl

Vector Differential Operator Del - Gradient of a Scalar Function - Directional Derivative - Geometric Interpretation - Gradient of the sum of Functions; of the product of functions and of a function of function - Operations involving Del - Divergence of a Vector and its Physical Interpretation - Curl of a Vector and its Physical Interpretation - Expansion Formulae for Operators involving Del - Solenoidal and Irrotational.

### UNIT-III: Vector Integration

The Line Integral - Surface Integral and its Physical Meaning - Surface Integral and the Concept of Divergence of a Vector - Equivalence of two Definitions of Divergence - Statements of Gauss Divergence Theorem and Green's Theorem (only) and Problems - Line Integral - The Concept of the Curl of a Vector - Statement of Stoke's Theorem (only) and Problems.

### UNIT-IV: Fourier Series

Euler's Formulae - Conditions for Fourier Expansion - Functions having Discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even periodic Functions - Half-range Series-Typical Wave Forms - Parseval's Formula.



**UNIT-V: Fourier Transform**

Definition - Fourier Integrals - Fourier Sine and Cosine Integral - Complex Form of Fourier Integral - Fourier Transform: Fourier Sine and Cosine Transforms - Finite Fourier Sine and Cosine Transforms (without proof) - Properties of Fourier Transforms - Convolution Theorem for Fourier Transforms - Parseval's Identity for Fourier Transforms - (without derivation)

**Recommended Text**

B.S.Grewal. *Higher Engineering Mathematics* (2002), Khanna Publishers, New Delhi.

**Reference Books**

1. G.B.Thomas and R.L.Finney. (1998) *Calculus and Analytic Geometry*, Addison Wesley (9<sup>th</sup> Edn), Mass. (Indian Print).
2. M.K.Venkataraman. (1992) *Engineering Mathematics-Part B*. National Publishing Company, Chennai.
3. P.R.Vittal. (2004) *Vector Calculus, Fourier series and Fourier Transform*. Margham Publications, Chennai.

**SKILL BASED SUBJECT**

**PAPER - 2**

**LINEAR PROGRAMMING**

**Objectives**

To improve the skills of solving very common problems which we come across in various fields like transportation, games and industries with machines.

**UNIT-I**

Linear programming problem - Mathematical formulation of the problem - Graphical solution method - simple method - Duality - primal and dual relation ( simple Problems).

**UNIT-II**

Transportation problem - Degeneracy in transportation problem.

**UNIT-III**

The Assignment problem – Travelling salesman method.

**UNIT-IV**

Game theory - two persons zero sum game - the maximin minimax principle - saddle points - games without saddle points.

**UNIT-V**

Simulation - application - advantages and disadvantages - Monte Carlo method - simple problems.

**Recommended Text**

Gupta P.K.and Hira D.S., (2000) Problems in Operations Research, S.Chand & Co. Delhi

**Reference Books**

1. Kanti Swaroop, Gupta P.K. and Manmohan, (2002) *Problems in Operation Research*, Sultan Chand & Sons.
2. Taha H.A. (2003) *Operations Research*, Macmillan Publishing Company, New York.
3. V.K.Kapoor [1989] *Operations Research*, Sultan Chand & sons.
4. P.R.Vittal (2003) *Operations Research*, Margham Publications, Chennai.
5. J.K.Sharma, (2001) *Operations Research: Theory And Applications* Macmillan, Delhi
6. S.J.Venkatesan, *Operations Research*, J.S. Publishes, Cheyyar-604 407.

**NON-MAJOR ELECTIVE**

**PAPER -2**

**FOUNDATION MATHEMATICS FOR COMPETITIVE EXAMINATIONS**

**Objectives**

To introduce concepts of mathematics with emphasis on analytical ability and computational skill needed in competitive examinations.

**UNIT-I**

Ratio and proportions

**UNIT-II**

Percentages

**UNIT-III**

Profit and loss, discounts.

**UNIT-IV**

Simple and compound interest.

**UNIT-V**

Time, Distance and Work

1. Recommended Text. Quantitative Aptitude - R.S. Aggarwal (S.Chand & Co. - New Delhi 2008)

**SEMESTER - V**

**PAPER - 7**

**ABSTRACT ALGEBRA**

**Objectives**

This course aims to impart emphasis on concepts and technology of the groups and rings as these algebraic structures have applications in Mathematical Physics, Mathematical Chemistry and Computer Science.

**UNIT-I: Groups**

Definition of a Group - Examples - Subgroups;

**UNIT-II: Groups (Contd)**

Counting Principle - Normal Subgroups - Homomorphisms.

**UNIT-III: Groups (Contd)**

Automorphisms - Cayley's Theorem - Permutation Groups.

**UNIT-IV: Rings**

Definition and Examples - Integral Domain - Homomorphism of Rings - Ideals and Quotient Rings.

**UNIT-V: Rings (Contd)**

Prime Ideal and Maximal Ideal - The field of quotients of an Integral domain – Euclidean rings.

**Recommended Text**

I.N.Herstein. (1989) Topics in Algebra, (2nd Edn.) Wiley Eastern Ltd. New Delhi

Chapter-2: Sections 2.1-2.10 (Omit Applications 1 and 2 of 2.7)

Chapter-3: Sections 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7

**Reference Books**

1. S.Arumugam. (2004) *Modern Algebra*. Scitech Publications, Chennai.
2. J.B.Fraleigh (1987). *A First Course in Algebra* (3<sup>rd</sup> Edition) Addison Wesley, Mass. (Indian Print)
3. Lloyd R.Jaisingh and Frank Ayres,Jr. (2005) *Abstract Algebra*, (2<sup>nd</sup> Edition), Tata McGraw Hill Edition, New Delhi.
4. M.L.Santiago (2002) *Modern Algebra*, Tata McGraw Hill, New Delhi.
5. Surjeet Singh and Qazi Zameeruddin. (1982) *Modern Algebra*. Vikas Publishing House Pvt. Ltd. New Delhi.

**PAPER - 8**

**REAL ANALYSIS I**

**Objectives**

To understand various limiting behavior of sequences and series

To explore the various limiting processes viz. continuity, uniform continuity, differentiability and integrability and to enhance the mathematical maturity and to work comfortably with concepts.

**UNIT-I: Functions & Sequences**

Functions – real valued functions – equivalence – countability and real numbers – least upper bound – definition of sequence and subsequence – limit of a sequence – convergent sequence  
Ch. 1.4 to 1.7, 2.1 to 2.3 of Goldberg.

**UNIT-I: Sequences [Contd...]**

Divergent sequences – Bounded sequences – Monotone sequence – Operations on convergent sequences – Operations on divergent sequences – Limit superior and Limit inferior – Cauchy sequences  
Ch. 2.4 to 2.10 of Goldberg.

**UNIT-III: Series of Real Numbers**

Convergence and Divergence – Series with non negative terms – Alternating series – conditional convergence and Absolute convergence – Test for Absolute convergence.  
Ch. 3.1 to 3.4 and 3.6 of Goldberg.

**UNIT-IV: Series of Real Numbers [Contd...]**

Test for Absolute convergence – The class  $\ell^2$  – Limit of a function on the real line – Metric spaces – Limits in Metric spaces.  
Ch. 3.7, 3.10, 4.1 to 4.3 of Goldberg.

**UNIT-V: Continuous Functions on Metric Spaces**

Functions Continuous at a point on the real line – Reformulation – Functions Continuous on a Metric Spaces – Open Sets – Closed Sets.  
Ch. 5.1 to 5.5 of Goldberg

**Recommended Text**

R.Goldberg [2000] Methods of Real Analysis. Oxford & IBH Publishing Co., New Delhi.

**Reference Books**

1. Tom M.Apostol [1974] Mathematical Analysis, 2<sup>nd</sup> Edition, Addison-Wesley New York.
2. Bartle, R.G. and Shebert [1976] Real Analysis, John Wiley and Sons Inc., New York.
3. Malik, S.C. and Savita Arora [1991] Mathematical Analysis, Wiley Eastern Limited, New Delhi.
4. Sanjay Arora and Bansi Lal [1991], Introduction to Real Analysis, Satya Prakashan, New Delhi.



## **PAPER - 9**

### **COMPLEX ANALYSIS - I**

#### **Objectives**

This course provides

- (i) a modern treatment of concepts and techniques of complex function theory
- (ii) To gain knowledge about the complex number system, the complex function and complex integration.

#### **UNIT-I: Complex numbers and Elementary functions**

Complex Number system, complex numbers –Algebraic properties-Point at Infinity Stereographic Projection-Function of a complex variable-Mappings-Elementary Functions- The Logarithmic function- Branches of  $\log Z$ .

Sections 1-10, 21-30.

#### **UNIT-II: Analytic functions**

Definitions of Limits -Continuity-Derivatives and Differentiation formula-Cauchy-Riemann equations-Cauchy-Riemann equations in polar form-properties of Analytic functions-Necessary and sufficient conditions for Analytic functions-problems. Sections 11-19.

#### **UNIT-III: Conformal Mappings**

Harmonic functions-Determination of Harmonic conjugate and Analytic functions-conformal mapping-Isogonal mapping-Further properties and examples-transformations of Harmonic functions.

Sections 20, 76-80.

#### **UNIT-IV Mapping by Elementary transformations**

The transformations  $w=z+d$ ,  $w=1/z$ ,  $w=z^2$ ,  $w=\sqrt{z}$ ,  $w=e^z$ ,  $w=\sin z$  Bilinear Transformation and special Bilinear Transformation problems.

Sections 31-36, 38-39

#### **UNIT-V: Integrals**

Contours - Line Integrals \_ Cauchy-Goursat's Theorem (with out proof) Cauchy's Integral Formula - Derivatives of Analytic Functions -problems.

Sections 43-46, 50-52.

**Recommended Text**

R.V.Churchill and J.W.Brown, (1984) *Complex Variables and Applications*. McGraw Hill International Book Co., Singapore. (Third Edition)

**Reference Books:**

1. P. Duraipandian and Laxmi Duraipandian (1976) *Complex Analysis*: Emerald Publishers, Chennai
2. S. Ponnusamy. (2000) *Foundations of Complex Analysis*, Narosa Publishing House, New Delhi
3. Murray R. Spiegel. (2005) *Theory and Problems of Complex Variable*. Tata-Mcgraw Hill Edition, New Delhi.

## **PAPER-10**

### **STATICS**

#### **OBJECTIVES**

This course introduces the students the basic concepts of forces, moments, couple, friction law virtual displacement and work, catenary and the centre of gravity and kinematics. This course stresses the development of skills in formation of suitable mathematical models and problems solving techniques.

#### **UNIT- I**

Forces, Type of forces- Resultant of three forces related to triangle acting at a point - Resultant of several forces acting on a particle - Equilibrium of a particle under three forces - Equilibrium of a particle under several forces - Limiting Equilibrium of a particle on an inclined plane.

#### **UNIT- II**

Moment of a forces- General motion of a Rigid body- Equivalent system of forces – Parallel forces- Forces along the sides of the triangle – Couples- Resultant of several coplanar forces – Equation of line of action of the resultant – Equilibrium of a rigid body under three coplanar forces.

#### **UNIT- III**

Reduction of coplanar forces into a force and a couple – Friction – laws of friction – cone of friction and angle of friction – Applications involving frictional forces.

#### **UNIT - IV**

Center of mass – Center of mass of a triangular lamina – Three particles of same mass - Three particles of certain masses – uniform rods forming a triangle – lamina in the form of a trapezium and solid tetrahedron – Center of mass using integration – circular arc – circular lamina – elliptic lamina – solid hemisphere – solid right circular cone – hemispherical shell – hollow right circular cone – cardioid lamina – Center of mass of a non-homogeneous solid.

#### **UNIT- V**

Equilibrium of a uniform homogeneous string - Equation of the shape of the strings hanging under gravity in Cartesian form – Equation of the shape of the string hanging under gravity in parametric form – Sag – Suspension bridge.

**Recommended Text**

**P. Duraipandian, Laxmi Duraipandian , Muthamizh Jayapragasam, Mechanics, 6-e,**  
S. Chand and Company Ltd, 2005.  
**Chapter 2,3,4,5,6,9** (Omit 5.2.1, 6.2.4, 6.3)

**Reference Books**

1. S. Narayanan, R. Hanumantha Rao, K. Sitaraman, P. Kandaswamy, *Statics*, S. Chand and Company Ltd, New Delhi.
2. S. L. Loney, *An Elementary Treatise on Statics*, Cambridge University Press, 1951
3. A.V. Dharmapadam(1991) *Mechanics*. S. Viswanathan Printers & Publishers. Chennai.
4. M.K. Venkataraman (1990) *Statics*. A Rajhans Publications. (16<sup>th</sup> Edn), Meerut.
5. Joseph F. Shelley (2005) *Vector Mechanics for Engineers Vol-I: Statics*, Tata McGraw Hill Edition, New Delhi.

## **PAPER - 11**

### **DYNAMICS**

#### **OBJECTIVES**

This course aims to provide models for some real life problems. This covers topics like Simple Harmonic Motion, Projectiles, Central Orbits and Moment of Inertia. Stress is on the mathematical formulation of the physics aspects of the problems and it develops logical deduction and interpretation.

#### **UNIT- I**

Velocity, Relative Velocity, Angular Velocity, Acceleration, Rectilinear motion, Rectilinear motion with constant acceleration, Relative angular velocity, Work, Power, Energy.

#### **UNIT- II**

Motion of a projectile, Nature of a trajectory, Results pertaining to the motion of a projectile, Range on an inclined plane, Maximum range on the inclined plane. Simple problems.

#### **UNIT -III**

Impulsive force, Conservation of linear momentum, Impact of a sphere, Laws of impact, Impact of two smooth spheres, Direct impact of two smooth spheres, Direct impact of a smooth sphere on a plane, oblique impact of a smooth sphere on a plane. Simple problems.

#### **UNIT- IV**

Central force and Central Orbit, Equation of central orbit, finding law of force and speed for a given orbit, Determination of the orbit when law of force is given, Kepler's Laws on planetary motion. Simple Problems.

#### **UNIT -V**

Moment of Inertia of simple bodies, Theorems of parallel and perpendicular axes, Moment of inertia of triangular lamina, circular lamina, circular ring, right circular cone, sphere. Simple problems.

**Recommended Text**

**P. Duraipandian, Laxmi Duraipandian ,MuthamizhJayapragasam,Mechanics, 6-e,**  
S. Chand and Company Ltd, 2005.

**Chapter 2,3,4,5,6,9** (Omit 5.2.1, 6.2.4, 6.3)

**Reference Books**

1. S. Narayanan, R. Hanumantha Rao, K. Sitaraman, P. Kandaswamy, *Statics*, S. Chand and Company Ltd, New Delhi.
2. S. L. Loney, *An Elementary Treatise on Statics*, Cambridge University Press, 1951
3. A.V. Dharmapadam(1991) *Mechanics*. S. Viswanathan Printers & Publishers. Chennai.
4. M.K. Venkataraman (1990) *Statics*. A Rajhans Publications. (16<sup>th</sup> Edn), Meerut.
5. Joseph F. Shelley (2005) *Vector Mechanics for Engineers Vol-I: Statics*, Tata McGraw Hill Edition, New Delhi.

**ELECTIVE**

**PAPER - 1**

**A. GRAPH THEORY**

**Objectives**

To study and develop the concepts of graphs, subgraphs, trees connectivity, Eulerian and Hamiltonian graphs, matching colorings of graphs and planar graphs

**UNIT-I**

Graphs, subgraphs, Degree of a vertex, Isomorphism of graphs, independent sets and coverings.

**UNIT-II**

Intersection graphs; Adjacency and incidence of matrices; Operations on graphs;;

**UNIT-III**

Walks; trails; paths; Connectedness and components; cut point, bridge, block.

**UNIT-IV**

Connectivity theorems and simple problems. Eulerian graphs and Hamiltonian graphs; simple problems

**UNIT-V**

Trees, theorems, and simple problems.

**Recommended Text**

S.Arumugam and S.Ramachandran, "Invitation to Graph Theory", SITECH Publications India Pvt. Ltd., 7/3C, Madley Road, T.Nagar, Chennai - 17

**Reference Books**

1. S.Kumaravelu, Susheela Kumaravelu, Graph Theory, Publishers, 182, Chidambara Nagar, Nagercoil-629 002.
2. S.A.Choudham, A First Course in Graph Theory, Macmillan India Ltd.
3. Robin J.Wilson, Introduction to Graph Theory, Longman Group Ltd.
4. J.A.Bondy and U.S.R. Murthy, Graph Theory with Applications, Macmillon, London.

## **B. ASTRONOMY**

### **Objectives**

This course aims to provide working knowledge about the universe.

### **UNIT-I**

Celestial Sphere - Diurnal motion - Simple Problems page 39 - 83 (Use the results 65,67,83,84) to solve problems.No derivation.)

### **UNIT-II**

Zones of Earth - Terrestrial Latitudes and Longitudes - Rotation of Earth - Dip of the horizon - - Simple problems. Page 90-131 (Use the results of 96,99,102 to solve problems. No need for derivation.

### **UNIT-III**

Twilight-simple problems-Astronomical refraction - Simple problems. page 131-157. (use the result of 124,125,126,127 to solve problems. No need to derive the result)

### **UNIT-IV**

Kepler's Laws - simple problems page 172-189. (Use results of 159,160 to solve the problems.No need to derive the results.

### **UNIT-V**

Moon - phases of moon - Eclipses - Introduction - umbra and penumbra - lunar eclipse - solar eclipse - condition for the occurrence of lunar and solar eclipses. Page 334-377. (Use the results of 270,271,272 to solve problem, no need to derive the results)

### **Recommended Text**

S.Kumaravelu and Susheela Kumaravelu. (2004) *Astronomy*. SKV Publishers, Nagarkoil



**Reference Books**

1. L.W.Frederick and R.H.Baker (1976) *Astronomy* (10<sup>th</sup> Edn) Van Nostrand, New York.
2. R.Jastrow and M.H.Thompson (1984) *Astronomy : Fundamentals and Frontiers*, (4<sup>th</sup> Edn) John Wiley & Sons, New York.
3. H.Karttunen et. al. (2003) *Fundamental Astronomy* (4<sup>th</sup> Edn) Springer Verlag, Berlin.
4. L.Motz and A.Duveen. (1977) *Essentials of Astronomy* (2<sup>nd</sup> Edn) Columbia University Press, New York.
5. G.V.Ramachandran. (1965) *A Text Book of Astronomy* ( 5<sup>th</sup> Edn) Published by Mrs. Rukmani Ramachandran, Tiruchirappalli
6. M.Zeilik (2002) *Astronomy: The Evolving Universe* (9<sup>th</sup> Edn) Cambridge University Press, Cambridge.

**SKILL BASED SUBJECT**

**PAPER - 3**

**QUANTITATIVE TECHNIQUES**

**Objectives**

To formulate / design and solve the practical problems in various fields using the quantitative techniques.

**UNIT-I: Statistical Techniques: Statistical Quality Control:**

Introduction – basis of control charts – control charts for variables – control charts for attributes – control charts for mean and variance.

**UNIT-II: Index Numbers:**

Introduction – construction of index number – classification of index number – wholesale index number – cost of living index numbers (Importance to be given only to simple problems)

**UNIT-III: Time series analysis:**

Introduction – components of time series – analysis of time series – measurement of trends (Importance to be given only to simple problems).

**UNIT-IV: Test of significance**

Definition of t-test and its applications,  $\chi^2$ -test and its applications.

**UNIT-V: Z-Transform Techniques**

Z-transform – elementary properties – Inverse Z – transforms – solution of difference equations using Z-transforms.

**Recommended Text**

1. S.C. Gupta and V.K.Kapoor, Fundamentals of Applied Statistics, S.Chand & Co., Delhi.
2. Kanti Swaroop, Gupta P.K. and Manmohan, Operations Research, Sultan Chand & Sons.
3. A.Singaravelu-[2007] – Engineering mathematics III, Meenakshi agency, Chennai-601302.

**Reference Books**

1. P.Kandasamy and others, Probability statistics and queuing theory, Sultan Chand & Sons.
2. V.Sundaresan, K.S. Ganapathy Subramanian and K.Ganesan, Resource management techniques, Meenakshi Pub., Arapakkam-609111 [Ph.04364–71417–20081]
3. Arumugam & Issac, Linear programming, New Gamma Pub., House Palayamkottai

## SEMESTER VI

### PAPER - 12

## LINEAR ALGEBRA

### Objectives

To study the Algebraic structures of Vector Spaces and Linear Transformation

### UNIT-I: Vector Spaces

Definition and examples-Linear dependence and independence

### UNIT-II: Vector Spaces (Contd)

Dual space - Inner Product spaces.

### UNIT-III: Linear Transformation

Algebra of linear transformations - Characteristic roots

### UNIT-IV: Linear Transformation (Contd)

Matrices, Canonical forms; Triangular forms.

### UNIT-V: Linear Transformation (Contd)

Trace and Transpose, Determinants

### Recommended Text

I.N.Herstein. (1989) *Topics in Algebra*. Wiley Eastern Ltd. New Delhi.

Chapter-4: Sections 4.1, 4.2, 4.3, 4.4,

Chapter-6: Sections 6.1, 6.2, 6.3, 6.4, 6.8, 6.9

### Reference Books

1. S.Arumugam. (2004) *Modern Algebra*. Scitech Publications, Chennai.
2. J.B.Fraleigh (1986) *A First Course in Algebra* (3<sup>rd</sup> Edition) Addison Wesley. Mass. (Indian Print)
3. S.Lipschutz (2005) *Beginning Linear Algebra*, Tata McGraw Hill Edition, New Delhi.
4. M.L.Santiago. (2002) *Modern Algebra*, Tata McGraw Hill, New Delhi.
5. Surjeet Singh and Qazi Zameeruddin. (1982) *Modern Algebra*. Vikas Publishing House Pvt. Ltd., New Delhi, 1982

**PAPER - 13**  
**REAL ANALYSIS II**

**Objectives**

To understand Integration process of Riemann

To develop the understanding of point wise and uniform convergence of sequence and series of functions.

To enhance the mathematical maturity and to work comfortably with concepts.

**UNIT-I: Connectedness, Completeness**

Open Sets – Connected Sets – Bounded Sets and Totally Bounded Sets – Complete Metric Spaces.

Ch. 6.1 to 6.4 of Goldberg

**UNIT-II: Compactness**

Compact Metric Space – Continuous Functions on Compact Metric Spaces - Continuity of Inverse Functions – Uniform Continuity.

Ch. 6.5 to 6.8 of Goldberg

**UNIT-III: Riemann Integration**

Sets of measure zero - Definition Riemann Integral – Properties of Riemann Integral – Derivatives.

Ch. 7.1, 7.2 7.4, 7.5 of Goldberg.

**UNIT-IV: Riemann Integration [Contd...]**

Rolle's Theorem – The law of mean – Fundamental theorems of calculus – Taylor's theorem.

Ch. 7.6 to 7.8 and 8.5 of Goldberg.

**UNIT-V: Sequences and Series of Functions**

Pointwise convergence of sequences of functions – Uniform convergence of sequences of functions – consequences of uniform convergence – Convergence and uniform convergence of series of functions.

Ch. 9.1 to 9.4 of Goldberg.

**Recommended Text**

R.Goldberg Methods of Real Analysis Oxford & IBH Publishing Co., New Delhi.

**Reference Books**

1. Tom M.Apostol [1974] Mathematical Analysis, 2<sup>nd</sup> Edition, Addison-Wesley Publishing Company Inc. New York.
2. Bartle, R.G. and Shebert [1976] Real Analysis, John Wiley and Sons Inc., New York,
3. Malik, S.C. and Savita Arora [1991] Mathematical Analysis, Wiley Eastern Limited, New Delhi.
4. Sanjay Arora and Bansi Lal [1991] Introduction to Real Analysis, Satya Prakashan, New Delhi.

**PAPER - 14**

**COMPLEX ANALYSIS II**

**Objectives:**

- (1) To gain knowledge about complex Integration and series.
- (2) This course provides methods to solve problems in pure as well as in applied mathematics.

**UNIT-I: Integrals:**

Morera's theorem- Maximum Moduli of functions- The fundamental theorem of Algebra-Liouville's theorem-convergence of sequences and series-uniform convergence. Sections 53-56, 61.

**UNIT-II: Power series.**

Taylor's and Laurent's theorem-Integration and differentiation of power series-problems. Sections 57-60.

**UNIT-III: Singularities and Residues.**

Singularities and classifications- Isolated singularities:Removable singularity Pole and essential singularity-Residues-Cauchy's Residue theorem-problems. Sections 67-71.

**UNIT-IV: Analytic continuation**

Conditions under which  $f(z) \neq 0$ -Uniqueness-Singular points:Poles and zeros-Essential singular points-Number of zeros and poles-The Argument principal. Sections 106 -114.

**UNIT V: Contour Integration**

Evaluation of Improper Real Integrals-Improper integrals involving Trigonometric functions -Integration around a Branch point. Sections 72-75.

**Recommended Text**

R.V.Churchill and J.W.Brown, (1984) *Complex Variables and Applications*. McGraw Hill International Book Co., Singapore. (Third Edition)

**Reference Books**

1. P. Duraipandian and Laxmi Duraipandian (1976) Complex Analysis: Emerald Publishers, Chennai.
2. S. Ponnusamy. (2000) Foundations of Complex Analysis, Narosa Publishing House, New Delhi.
3. Murray R. Spiegel. (2005) Theory and Problems of Complex Variable. Tata-Mcgraw Hill Edition, New Delhi.



**PAPER - 15**

**PROGRAMMING IN C LANGUAGE**

**Objectives**

To develop programming skill in the Computer Language C

**UNIT-I**

C Constants, variables, Data-type, Declaration of variables, assigning values to variables.

**UNIT-II: Operators**

Arithmetic, Relational, Logical, Assignment, Increment and decrement, Conditional, Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic operators, Formatted input and output.

**UNIT-III: Operators and Arrays**

Decision making and branching If, simple if, If else, Nesting of if - else, Else - If ladder, Switch statement, the?: operator, Go to statement. Decision making with looping: While, Do, For statement, Jumps in loops. **Arrays:** 1 - dimensional array, 2 - dimensional array, Initializing 2 - dimensional array, Multi - dimensional arrays.

**UNIT-IV: User-Defined Function**

Need for User-defined function, Multi-function program, the form of C-Function, Return Value and their types.

**Structures and Unions:**

Structure definition, Structure initialization, Comparison of structure variables, union.

**UNIT-V: Pointers**

Understanding Pointers, Accessing the address of a variable, Declaring and initializing of pointers, accessing a variable through its pointer, Pointer expression. Pointers and arrays, Pointers and structures.

**Recommended Text**

E.Balagurusamy. (1996) *Programming in ANSI C*. Tata McGraw Hill, New Delhi

**Chapters:**

2.5 to 2.9, 3.2 to 3.7, 3.10 to 3.12, 4.4 to 4.5

5.2 to 5.9, 6.2 to 6.5, 7.2 to 7.5, 9.2 to 9.5

10.2, 10.4, 10.5, 10.10, 11.2 to 11.6, 11.8, 11.11

**Reference Books**

1. V.Rajaraman. (1995) *Computer Programming in C*. Prentice Hall. New Delhi
2. H. Schildt, Osborne. (1994) *Teach Yourself C* McGraw Hill. New York.
3. Mullish Cooper. *The Spirit of C- An Introduction to Modern Programming*. Jaico Publishing House. Delhi. 1998.
4. Yashavant kanetkar, let us C, 16<sup>TH</sup> edition BPB publication.

## **PRACTICAL IN C LANGUAGE**

### **Objectives**

This computer practice course aims to provide strong logical thinking and error-free syntax codes writing, to master the debugging techniques and to present the results in neat form in C Language for numerical methods. Students will be able to solve problems numerically whenever theoretical methods are not available.

The following exercises shall be performed as minimum mandatory requirements (for eligibility to take the practical examination) and a RECORD of the code-listing and outputs shall be maintained by each students.

1. Assigning the ASCII value.
2. Square of numbers: Using For loop, While loop
3. Square of numbers: Do-While loop, Goto statement.
4. Characters between two given characters.
5. Number of vowels and consonants.
6. Three – dimensional matrix.
7. Prime numbers between two give numbers.
8. Fibonacci series.
9. Factorial numbers
10. Power of a value.
11. Interchange sort.
12. Student record.

Note: Mathematics faculty should be appointed as an Examiner.

### **Reference Books**

1. The spirit of C, Mullish Cooper, Indian Edition by Jaico Publishers, 1987.
2. Teach yourself C, Herbert Schildt, Obsbome Megrawhill, 2<sup>nd</sup> Edition 1994.
3. Programming in C, Schaum Series.

**ELECTIVE**

**(to choose 1 out of the given 2)**

**PAPER - 2**

**OPERATIONS RESEARCH**

**Objectives**

To develop computational skill and logical thinking in formulating industry oriented problems as a mathematical problem and finding solutions to these problems.

**UNIT-I**

Network-construction of network diagram-Critical path method (CPM) – Three floats

**UNIT-II**

Three time estimates-Network scheduling by PERT Method-PERT Computation

**UNIT-III**

Inventory models - EOQ model (a) Uniform demand rate infinite production rate with no shortages (b) Uniform demand rate finite production rate with no shortages – Inventory control with Price Breaks.

**UNIT-IV**

Sequencing problem - n jobs through 2 machines, n jobs through 3 machines - two jobs through m machines – n jobs through m machines.

**UNIT-V**

Queuing Theory - Basic concepts - Steady state analysis of M/M/1 and M/M/N systems with finite and infinite capacities.

**Recommended Text** Gupta P.K. and Hira D.S. (2000) *Problems in Operations Research*, S.Chand & Co. Delhi

**Reference Books**

1. J.K.Sharma, (2001) *Operations Research: Theory and Applications*, Macmillan, Delhi
2. Kanti Swaroop, Gupta P.K. and Manmohan, (1999) *Problems in Operations Research*, Sultan Chand & Sons., Delhi.
3. V.K.Kapoor [1989] *Operations Research*, sultan Chand & sons.
4. Ravindran A., Philips D.T. and Solberg J.J., (1987) *Operations research*, John Wiley & Sons, New York.
5. Taha H.A. (2003) *Operations Research*, Macmillan Publishing Company, New York.
6. P.R.Vittal (2003) *Operations Research*, Margham Publications, Chennai.
7. S.J.Venkatesan, *Operations Research*, J.S. Publishers, Cheyyar-604 407.
8. Arumugam & Issac, *Operations research - Vol. - I*, New Gamma Pub., House. Palayamkottai.

## **PAPER - 2**

### **CALCULUS OF FINITE DIFFERENCES AND NUMERICAL METHODS**

(to be chosen only by those students who have not taken Numerical Methods as Allied subject)

#### **Objectives**

This course covers the basic methods for finding the finite difference, solution of simultaneous equations and the techniques of Numerical Differentiation and Numerical Integration. It also deals with solution of Algebraic and Transcendental equations.

**(Note: All The Formulae Without Proof - Units I to V)**

#### **UNIT-I: Finite differences & Interpolation**

Forward difference operator  $\Delta$  and Backward difference operator  $\nabla$  and shifting operator  $E$ , Relation between  $\Delta$ ,  $\nabla$  and  $E$  - Interpolation - Newton - Gregory forward & backward formulae, Estimating the missing terms- Lagrange's and Newton's divided difference Formula for unequal intervals.

#### **UNIT-II: Solutions of simultaneous linear equations**

Gauss elimination method - matrix inversion method - Gauss-Jordan Method, Gauss – Seidal method.

#### **UNIT-III: Numerical Differentiation**

Newton's forward and backward differences formulae to compute derivatives - using Gauss forward and backward formulae.

#### **UNIT-IV: Numerical Integration**

General Quadrature formula - Trapezoidal rule - Simpson's one third rule - Simpson's three-eight rule.

#### **UNIT-V: Solution of Algebraic and Transcendental Equations:**

Bisection method - Regula - falsi method (False Position method) - Newton-Raphson method. Numerical solution of ordinary Differential equation (First order only): Euler's method, modified Euler's method, Picard's method, Runge - Kutta method

**Recommended Text**

1. B.D. Gupta. (2001) *Numerical Analysis*. Konark Pub. Ltd., Delhi.
2. H.C.Saxena, *Calculus of finite differences and Numerical Analysis*, S.Chand & Co., New Delhi. IX Edition.

**Reference Books**

1. M.K.Venkataraman. (1992) *Numerical methods for Science and Engineering* National Publishing Company, Chennai.
2. S. Arumugam (2003) - *Numerical Methods*, New Gamma Pub., for Palayamkottai.
3. A.Singaravelu, *Numerical Methods*, Meenakshi Publications-First Edition 1992.

**ELECTIVE - III**

**PAPER – 3**

**A. SPECIAL FUNCTIONS**

**Objectives**

To develop computational skill in certain special functions which are frequently occurring in higher mathematics and mathematical physics.

**UNIT-I**

Properties of Linear Operators - Simultaneous Linear Differential Equations -

**UNIT-II**

Special Solvable Types of Nonlinear Equations. Numerical Solutions Using Taylor Series -

**UNIT-III**

- Adams and Modified Adams Method - Extrapolation with Differences  
Properties of Power Series - Examples

**UNIT-IV**

- Singular Points of Linear Second Order Differential Equations - Method of Frobenius.

**UNIT-V**

Bessel Functions - Properties – Legendre Functions.

**Recommended Text**

F.B.Hildebrand. (1977) *Advanced Calculus for Applications*. Prentice Hall. New Jersey.

**Reference Books**

1. J.N.Sharma and R.K.Gupta (1998) *Special Functions*, Krishna Prakashan Mandir, Meerut.
2. Satya Prakash. (2004) *Mathematical Physics*. Sultan & Sons. New Delhi.
3. B.D.Gupta (1978) *Mathematical Physics*, Vikas Publishing House.



**PAPER – 3**

**FUZZY MATHEMATICS**

**Objectives**

1. To know the fundamentals of fuzzy Algebra.
2. To know the basic definitions of fuzzy theory
3. To know the applications of fuzzy Technology.

**UNIT-I**

Introduction- Fuzzy subsets-Lattices and Boolean Algebras-  $\alpha$  fuzzy sets-operations on fuzzy  $\alpha$  level sets – properties of fuzzy subsets of a set. section s 1.1-1.10

**UNIT-II**

Algebraic product and sum of two fuzzy subsets-properties satisfied by Addition and product-cartesian product of fuzzy subsets. Sections 1.11-1.13.

**UNIT-III**

Introduction- Algebra of fuzzy relations-logic-connectives. section s 2.1-2.4

**UNIT-IV**

Some more connectives-Introduction-fuzzy subgroup-homomorphic image and Pre-image of subgroupoid. Sections 2.5,3.1-3.3

**UNIT-V**

Fuzzy invariant subgroups-fuzzy subrings.

Section 3.4 and 3.5.

Recommended Text S.Nanda and N.R.Das “Fuzzy Mathematical concepts,Narosa Publishing House, New Delhi.

**SKILL BASED SUBJECT**

**PAPER - 4**

**FUNDAMENTALS OF APPLIED MATHEMATICS**

**Objectives**

This course aims to develop mathematical maturity and ability to deal with abstraction and to develop construction and verification of formal logical manipulation.

**UNIT-I: Recurrence Relations and Generating Functions**

Recurrence - Polynomials and their Evaluations - Recurrence Relations - Solution of Finite Order Homogeneous [linear] Relations - Solutions of Non-homogeneous Relations.

**UNIT-II: Mathematical Logic**

TF Statements - Connectives - Atomic and Compound Statements - Well-formed [Statement Formulae] - Parsing - Truth Table of a Formula - Tautology - Tautological Implications and Equivalence of Formulae.

**UNIT-III: Mathematical Logic [Contd..]**

Replacement process - Functionally complete sets of connectives and Duality law - Normal Forms - Principal Normal Forms.

**UNIT-IV: Lattices**

Lattices [omit example 15 Pp No.10.6) - Some properties of Lattices - New Lattices (omit remark Pp 10.14) - Modular and Distributive Lattices (omit theorem 10 and 17, Example 4 - Pp 10.23, Example 11 - Pp 10.24)

**UNIT-V: Boolean Algebra**

Boolean Algebra (omit theorem 25) – Boolean Polynomials – Karnaugh Maps (omit K–map for 5 and 6 variables)

**Recommended Text**

M.K.Venkataraman, N.Sridharan and N.Chandrasekaran, [2003] Discrete Mathematics, The National Publishing Company, Chennai.

**Reference Books**

1. R.Johnsonbaugh [2001] Discrete Mathematics [5<sup>th</sup> Edn.] Pearson Education, Asia.,
2. C.L.Liu, [1985] elements of Discrete Mathematics, McGraw Hill, New York,
3. J.Truss. [2000] Discrete Mathematics for Computer Scientists [2<sup>nd</sup> Edn.] Pearson Education, Asia.
4. M.K.Sen and B.C.Chakraborty [2002] Discrete Mathematics [2<sup>nd</sup> Edition,] Books and allied private Ltd., Kolkata.

**ALLIED SUBJECTS FOR MATHEMATICS STUDENTS.**

To choose any two out of the following Four Allied Subjects as Allied I and Allied II. Each Allied subject consists of two Examination Papers as Paper I and Paper II.

1. Numerical methods (Paper I and II)
2. Physics ( Paper - I and II )
3. Chemistry ( Paper- I and II )
4. Mathematical Statistics (Paper- I and II )

## ALLIED PAPERS

### NUMERICAL METHODS - I

#### Objectives

This course will cover basic methods for finding the Finite differences, Central differences, Inverse interpolation, Summation of series, Interpolation for equal & unequal intervals, Solutions of simultaneous equations, Important principles, Method and Processes to get numerical results, Reliability of numerical result.

#### UNIT-I: Finite Differences

First and higher order differences-forward differences and Backward differences-Properties of operators-Differences of a Polynomial-Factorial Polynomials-Operator  $E$ , Relation between  $\Delta$ ,  $\nabla$  and  $E$  – Interpolation - Newton - Gregory forward & backward formulae for interpolation.

#### UNIT-II: Central Differences

Central difference Operators-Central differences formulae: Gauss Forward and Backward formulae-Sterling's formula-Bessel's formula.

#### UNIT-III: Interpolation for Unequal Intervals

Divided differences-Newton's divided differences formula and Lagrange's-Estimating the Missing terms (With one or more missing values).

#### UNIT-IV: Inverse Interpolation

Lagrange's method and Reversion of series method (Using Newton's forward formula only).  
Summation of series: Sum to  $n$  term of the series whose general term is the first difference of a function-summation by parts.

#### UNIT-V: Solutions of Simultaneous Linear Equations

Gauss elimination method-matrix inversion method-Gauss-Jordan Method, Gauss-Seidal method (Three unknowns only).

**Recommended Text**

1. B.D. Gupta.(2001) *Numerical Analysis*. Konark Pub. Ltd., Delhi
2. M.K. Venkataraman. (1992) *Numerical methods for Science and Engineering* National Publishing Company, Chennai.

**Reference Books**

1. S. Arumugham. (2003) *Numerical Methods*, New Gamma Publishing, Palamkottai.
2. H.C. Saxena. (1991) *Finite differences and Numerical analysis* S.Chand & Co., Delhi
3. A.Singaravelu (2004). *Numerical Methods* Meenakshi Agency, Chennai
4. P.Kandasamy, K.Thilagavathy (2003) *Calculus of Finite difference & Numerical Analysis*, S.Chand & Company Ltd., New Delhi-55.

## NUMERICAL METHODS II

### Objectives

This course covers the techniques of Numerical Differentiation and Numerical Integration. It also deals with solution of difference equations, Algebraic and Transcendental equations and Numerical solution of Ordinary differential equations of first order.

### UNIT-I: Numerical Differentiation

Newton's forward and backward differences to compute derivatives-derivative using divided differences formula-maxima and minima using the above formulae.

### UNIT-II: Numerical Integration

General Quadrature formula-Trapezoidal rule-Simpson's one third rule- Simpson's three-eight rule, Weddle's rule- Euler-Maclaurin Summation Formula

### UNIT-III: Difference Equations

Linear differences equations-Linear homogeneous difference equation with constant coefficient-Particular integrals for  $a^x$ ,  $x^m$ ,  $\sin ax$ ,  $\cos ax$  and  $a^x f(x)$ .

### UNIT-IV: Solution of Algebraic and Transcendental Equations

Bisection method-Iteration method-Regula-falsi method (False Position Method)-Newton-Rapson Method.

### UNIT-V: Numerical Solution of Ordinary Differential Equations (First order only)

Euler's method- Euler's modified method-Picard's method - Taylor's methods-Runge-Kutta method (Fourth order only).

### Recommended Text

1. B.D. Gupta. (2001) *Numerical Analysis*. Konark Pub. Ltd., Delhi
2. M.K.Venkataraman. (1992) *Numerical methods for Science and Engineering* National Publishing Company, Chennai.

### Reference Books

1. Gupta-Malik, Calculus of finite differences and numerical Analysis, Krishba Prakashan Mandir, Meerut Seveenth Edition.
2. S.C.Saxena, Calculus of finite differences and Numerical Analysis, S.Chand & Co., New Delhi. IX Edition.

3. A.Singaravelu, Numerical methods, Meenakshi Publications-First Edition 1992.
4. P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite Difference & Numerical Analysis, S.Chand & Company Ltd., New Delhi-55.



**ALLIED  
PHYSICS - I**

**UNIT – I: PROPERTIES OF MATTER**

Elasticity : Hooke's Law – Elastic Constants – bending of beam – Bending moment – Cantilever Depression at the loaded end of a cantilever – determination of Young's modulus by non-uniform bending.

Torsion : Torsion couple – Potential energy in a twisted wire – Torsional pendulum – Time period – Rigidity Modulus – Determination of rigidity modulus by Torsional oscillation (without masses).

Viscosity: Viscosity of a liquid – Viscous force – Co-efficient of viscosity of a liquid – Poiseuille's formula – Comparison of viscosities of two liquids by graduated burette method.

Surface Tension: Surface Tension – Excess of pressure inside a curved surface – Synclatic system – Surface Tension and interfacial surface tension by the method of drops.

**UNIT – II: HEAT**

Heat: Specific heat – Newton's law of cooling – determination of specific heat of a liquid using Newton's law of cooling – Emissivity and Emissive Power.

Low Temperature: J.K. Effect – Positive Effect – Negative Effect – Temperature of Inversion – Super conductors. Type I and II – Meisner Effect – Helium I and II.

**UNIT – III: ELECTRICITY AND MAGNETISM**

Electricity: Potentiometer – Principle – Calibration of low range voltmeter – Measurement of internal resistance of cell – measurement of an unknown resistance.

Magnetism – Moment and pole strength of a magnet – Deflection magnetometer – Tan C position – Vibration magnetometer – Theory – Period of Oscillation – Determination of  $M$  and  $B_H$  using the deflection magnetometer in Tan C position and the vibration magnetometer.

**UNIT – IV: SOUND AND ACOUSTICS OF BUILDING**

Sound: Transverse vibration of strings – Velocity and frequency of vibrations of a stretched string – laws – sonometer – A.C. Frequency – Steel Wire – Brass wire.

Ultrasonics – Production by Piezo – electric method – properties and uses.

Acoustics of buildings: Reverberation – Reverberation time – Sabine's formula (definition only) – Sound absorption co-efficient of surface – conditions for the perfect acoustics.

**UNIT – V: GEOMETRICAL OPTICS AND PHYSICAL OPTICS**

Defects of Images (Lens): Spherical aberration – minimizing spherical aberration by using two thin lenses in contact – chromatic aberration – Achromatic combination of two thin lenses in contact.

Physical Optics: Interference – Air Wedge – Description – Test for optical flatness of glass plate – Determination of diameter of a thin wire by air wedge.

Diffraction: Theory of transmission grating – Normal Incidence – Determination of Wavelength of monochromatic source and Wavelength of mercury line using a grating by normal Incidence.

Polarisation: Optical activity – Specific rotatory power – Polarimeter – Determination of specific rotatory power of a solution using the polarimeter.

**Books for Study & REFERENCE**

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics – N. Brijlal and Subramaniam S. Chand & Co.
6. A text book of Sound – by M. Narayanamoorthy and other National Publishing Companies (1986).
7. Modern Physics – R. Murugesan S. Chand & Co. (2004).

**ALLIED  
PHYSICS II**

**UNIT – I: WAVE MECHANICS**

Wave Mechanics – De Broglie Waves – Dual Nature – Experimental Study of Matter Waves – Davission and Germer's Experiment – G.P. Thomson's Experiment – Heisenberg's uncertainty Principle – The position and moment of a particle.

**UNIT – II : NUCLEAR PHYSICS**

Particle accelerators – cyclotron, particle detectors – GM Counter Artificial Transmutation – Rutherford's Experiment – The Q value equation for nuclear reaction – Threshold energy – Nuclear Reactions.

Conservation Laws: Conservation of Charge – Conservation of Nucleons – Conservation of Mass – Energy – Conservation of Parity – Quantities conserved and quantities not conserved in a nuclear reaction.

Biological effects of radiation – control of radiation hazards.

**UNIT – III : ENERGY PHYSICS**

Sources of conventional energy – Need for non-conventional energy resources – solar energy utilization – solar water heater – solar drier – conversion of light into electrical energy – solar cell – merits and demerits of solar energy – wind energy – its conversion systems – energy from Bio mass – Bio gas generation – Industrial and space application.

**UNIT – IV : CRYSTALLOGRAPHY AND FIBRE OPTICS**

Crystallography : The crystal structure – Unit Cell – Miller indices – Reciprocal Vectors – Properties of Reciprocal Lattice – Bragg's Law.

Fibre Optics : Principle – classification of optical fibres – fiber optic communication system block diagram.

**UNIT – V : ELECTRONICS**

Electronics : Zener diode – Characteristics – Voltage regulation using zener diode – LED – uses of LED.

Digital Electronics : AND, OR, NOT, NAND and NOR gates – NAND and NOR as universal building blocks – Fabrication of a Integrated circuit by monolithic technology – Advantages and limitations of an integrated circuit – LSI, MSI and VLSI.

**Books for Study & REFERENCE**

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics – N. Brijlal and Subramaniam S. Chand & Co.
6. A text book of Sound – by M. Narayanamoorthy and other National Publishing Companies (1986).
7. Modern Physics – R. Murugesan S. Chand & Co. (2004).
8. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.
9. Introduction to Solid State Physics – C. Kittel, 5<sup>th</sup> Edition Wiley Eastern Ltd.
10. Renewable & Sustainable energy sources – Agarwal.
11. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999).

**ALLIED PRACTICAL**

**PHYSICS**

**(Any 15 Experiments)**

1. Young's modulus – non uniform bending – pin and microscope.
2. Rigidity modulus – Static Torsion Method Using Scale and Telescope.
3. Rigidity modulus – Torsional oscillation method (without symmetric masses).
4. Determination of Co-efficient of Viscosity – Graduated Burette.
5. Surface Tension and Interfacial Tension – By drop weight method.
6. Specific Heat Capacity of a liquid – by Newton's Law of Cooling.
7. Sonometer – Determining A.C. Frequency. (Screw Gauge is given).
8. Sonometer – frequency of tuning fork.
9. Newton's Rings – Radius of Curvature.
10. Air Wedge – Determination of thickness of thin wire.
11. Spectrometer Grating – Minimum Deviation – Mercury Lines.
12. Spectrometer – Refractive Index of a liquid – Hollow Prism.
13. Potentiometer – Calibration of High Range Ammeter.
14. Potentiometer – Calibration of Low Range Voltmeter.
15. Determination of  $M$  and  $B_H$  using Deflection Magnetometer in Tan C position and vibration magnetometer.
16. Figure of merit and voltage sensitiveness of table galvanometer.
17. Construction of AND, OR gates using diodes and NOT by transistors.
18. Zener diode – Voltage Regulation.
19. NAND / NOR as universal gate.
20. Demorgan's theorem verification.

**ALLIED  
CHEMISTRY – I**

**UNIT-I**

- 1.1 Extraction of Metals – Minerals and Ores – Difference – Minerals of Iron, Aluminum and Copper – Ore dressing or Concentration of Ore – Types of Ore Dressing - Froth Floatation and Magnetic separation.
- 1.2 Refining of Metals – Types of Refining – Electrolytic, Van Arkel and Zone refining.
- 1.3 Extraction of Thorium.

**UNIT-II**

- 2.1 Preparation and Properties of Cyclohexane. Baeyer Strain Theory.
- 2.2 Polar Effects – Inductive effect, mesomeric effect and steric effect. (Acid and Base Strength).
- 2.3 Stereoisomerism – Types, Causes of optical activity of lactic acid and tartaric acid . Geometrical isomerism – maleic and fumaric acid.

**UNIT-III**

- 3.1 Chemical Kinetics – Distinction between Order and Molecularity. Derivation of First order rate equation – half life period of first order reactions.
- 3.2 Catalysis – Catalyst – auto catalyst – enzyme catalyst – promoters – catalytic poisoning – Active center – Distinction between homogeneous and Heterogeneous catalysis – Industrial applications of catalyst.
- 3.3 Photochemistry – Grothus Drapers law, Stark Einstein's law – quantum yield – photosynthesis, phosphorescence, fluorescence – chemiluminescence – photosensitization.

**UNIT-IV**

- 4.1 VSEPR Theory – Shapes of simple molecules  $\text{BF}_3$ ,  $\text{PCl}_3$ ,  $\text{SF}_6$  and  $\text{XeF}_6$ .
- 4.2 Fuels – Calorific value of fuels – non conventional fuels – need of solar energy – Applications – Bio fuels.
- 4.3 Osmosis – Osmotic pressure – reverse osmosis – desalination of sea water.

**UNIT-V**

- 5.1 Nuclear Chemistry – Definition of Half life period – Group displacement law – Radioactive series. Nuclear Fission and Fusion – Application of nuclear chemistry in Medicine, Agriculture, Industries –  $C^{14}$  Dating.
- 5.2 Crude oil - Petroleum – Petroleum refining – Cracking – Applications of Cracking. Naphthalene – Preparation – Properties and uses of Naphthalene.
- 5.3 Elements of Symmetry – Unit cell – Crystal lattice – types of cubic lattice – one example each.

**ALLIED  
CHEMISTRY – II**

**UNIT-I: Co-ordination Chemistry**

- 1.1 Nomenclature of Coordination Compounds - Werner Theory of Coordination Compounds – Chelation – Functions and structure of haemoglobin and chlorophyll.
- 1.2 Industrial Chemistry:  
Fertilizers and manures – Bio fertilizer – Manures and their importance – Role of NPK in plants – preparations and uses of urea, Ammonium nitrate, Potassium nitrate and super phosphate of lime.
- 1.3 Contents in Match sticks and match box – industrial making of safety matches. Preparation and uses of chloroform, DDT, gammexane and Freon.

**UNIT-II: Carbohydrates**

- 2.1 Classification – structure of glucose – properties and uses of starch – uses of Cellulose nitrate – Cellulose acetate.
- 2.2 Amino Acids and Proteins  
Classification of amino acids – preparation and properties of Glycine – Classification of proteins based on physical properties and biological functions.
- 2.3 Primary and Secondary structure of protein (Elementary treatment only) composition of RNA and DNA and their biological role. Tanning of leather –alum (aluminum trichloride tanning –Vegetable tanning)

**UNIT-III: Electrochemistry**

- 3.1 Specific and equivalent conductivity their determination – effect of dilution on conductance.
- 3.2 Kohlrausch law – Determination of dissociation constant of weak Electrolyte using conductance measurement – Conductometric Titrations.
- 3.3  $P^H$  and determination by indicator method – Buffer Solutions – Buffer action – importance of buffer in the living system – Derivation of Henderson equation.

**UNIT-IV**

- 4.1 Paints – Pigments – Components of paints - Requisites of a good paint. Colour and Dyes – Classification based on constitution and application.



- 4.2 Vitamins  
Biological activities and deficiency diseases of vitamin A, B, C, D and K – Hormones –  
Functions of insulin and adrenaline.
- 4.3 Chromatography –Principles and applications of column, paper and thin layer  
chromatography.

**UNIT-V**

- 5.1 Drugs – Sulpha drugs Uses and mode of action of sulpha drugs – Antibiotics – Uses of  
Penicillin, Chloroamphenicols, streptomycin. Drug abuse and their implication- alcohol –  
LSD
- 5.2 Anaesthetics – General and local anaesthetics – Antiseptics – Example and their  
application. Definition and one example each for analgesics, antipyretics, tranquillizers,  
sedatives, causes of diabetes, cancer and Aids.
- 5.3 Electrochemical Corrosion and its prevention.

**ALLIED CHEMISTRY  
PRACTICAL**

**VOLUMETRIC ANALYSIS**

1. Estimation of hydrochloric acid using standard sulphuric acid.
2. Estimation of Borax using standard sodium carbonate.
3. Estimation of  $\text{FeSO}_4$  using standard Mohr salt solution.
4. Estimation of Oxalic acid using standard  $\text{FeSO}_4$ .
5. Estimation of  $\text{K}_2\text{Cr}_2\text{O}_7$  using standard  $\text{K}_2\text{Cr}_2\text{O}_7$ .
6. Estimation of Copper using standard copper sulphate.
7. Estimation of  $\text{Fe}^{2+}$  using diphenylamine / N-Phenyl anthranilic acid as indicator  
Students must write the short procedure for the given Estimation in the examination and submit the paper for evaluation.

**ORGANIC ANALYSIS**

Reactions of Aldehyde (aromatic), Carbohydrate, Carboxylic acid (mono and dicarboxylic acid) , Phenol, Aromatic primary amine, Amide, and Diamide. Systematic Analysis of Organic compounds containing one functional group and characterization of confirmatory tests.

## **ALLIED**

### **MATHEMATICAL STATISTICS - I**

#### **Objective**

To apply Statistics Methods for Mathematical Problems

#### **UNIT-I**

Concept of Sample Space - Events - Definition of Probability (Classical, Statistical and Axiomatic) - Addition and Multiplication laws of Probability - Independence of Events - Conditional Probability - Baye's Theorem - Simple Problems.

#### **UNIT -II**

Random Variables (Discrete and Continuous) - Distribution Function - Expectation and Moments - Moment Generating Function - Probability Generating Function - Cumulant Generating Function - Simple Problems.

#### **UNIT-III**

Characteristic Function - Properties - Uniqueness and Inversion Theorem (Statement only) Chebychev's Inequality - Simple Problems

#### **UNIT-IV**

Concept of Bivariate Distribution - Correlation - Karl Pearson's Coefficient of Correlation - Rank Correlation - Linear Regression - Concept of Partial and Multiple Correlation (Three Variables only).

#### **UNIT-V**

Standard distributions: Discrete distributions - Binomial, Poisson, Hyper Geometric and Negative Binomial Distributions - Continuous Distributions Normal, Uniform, Exponential, Gamma and Beta Distributions - Interrelationship among these Distributions

#### **Books for Reference**

1. Hogg, R.V. & Craig.A.T.(1998) : Introduction to Mathematical Statistics, Macmillan
2. Mood. A.M. Graybill. F.A.& Boes.D.G.(1974) : Introduction to theory of Statistics, McGraw Hill.
3. Snedecor.G.W. & Cochran.W.G.(1967) : Statistical Methods, Oxford and IBH
4. Hoel, P.G (1971): Introduction to Mathematical Statistics, Wiley.
5. S.C. Gupta & V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan & sons

6. Wilks S.S. Elementary Statistical Analysis, Oxford and IBH

**ALLIED**

**MATHEMATICAL STATISTICS II**

**Objective**

To apply Statistics for Mathematical problems

**UNIT-I**

Statistical Population Census and Sampling Survey - Parameter and Statistics - Sampling and Sampling Distribution and Standard Error. Sampling distributions - students 't', chi - square and F distributions.

**UNIT-II**

Test of significance - Large sample test for proportion, mean and standard deviation - Exact test based on 't', Chi - square and F distribution with respect to population mean, variance and correlation coefficient - Tests of independence of attributes - goodness of fit tests.

**UNIT-III**

Point estimation - Concept of unbiasedness, consistency, efficiency and sufficiency - Cramer- Rao Inequality - Methods of Estimation - Maximum Likelihood Estimation - Method of Moments - Interval Estimation - Confidence Interval for Population Mean, Proportion and Variance Based on Normal, 't' Chi-square and F Distributions.

**UNIT-IV**

Test of Hypothesis: Null and Alternate Hypothesis - Type I and Type II error - Power of the test - Neymann Pearson lemma - Likelihood Ratio Test - Concept of Most Powerful test (Statement and Results only) - Simple Problems

**UNIT-V**

Analysis of Variance - One - way and Two-way Classification - Basic Principles of Design of Experiments - Randomization, Replication, Local Control, Completely Randomized Design, Randomized Block Design and Latin Square Design

**Books for Reference**

1. Hogg, R.V. & Craig. A. T. (1998): Introduction to Mathematical Statistics, Macmillan
2. Mood.A.M., Graybill. F.A.& Boes. D.G.(1974): Introduction to theory of Statistics, McGraw Hill.
3. Snedecor.G.W. & Cochran.W.G.(1967): Statistical Methods, Oxford and IBH

4. Hoel.P.G (1971): Introduction to Mathematical Statistics, Wiley.
5. Wilks . S. S.Elementary Statistical Analysis, Oxford and IBH
6. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan & sons
7. O. Kempthorne - Design of Experiments
8. S.C. Gupta & V.K. Kapoor: Fundamentals of Applied Statistics, Sultan & sons
9. Das and Giri : Design of Experiments Wiley Eastern

**ALLIED PRACTICAL**  
**MATHEMATICAL STATISTICS**

1. Measures of location and Dispersion (absolute and relative)
2. Computation of Correlation Coefficient for raw and Grouped data, Rank Correlation Coefficient
3. Computation of Regression Equations for Raw and Grouped Data
4. Curve Fitting by the Method of Least Squares
  - a.  $y=ax+b$
  - b.  $y=ax^2+bx+c$
  - c.  $y=ae^{bx}$
  - d.  $y=ax^b$
5. Fitting of Binomial, Poisson, Normal distributions and tests of goodness of fit.
6. Large sample tests with regard to population mean, proportion, standard deviation
7. Exact tests with Respect to Mean, Variance and Coefficient of Correlation
8. Test for Independence of Attributes Based on Chi-Square Distribution
9. Confidence Interval based on Normal, t and Chi-square and F Distributions
10. Problems based on ANOVA-one way and two way Classification
11. Completely Randomized Design
12. Randomized Block Design
13. Latin Square Design

**Note**

Use of scientific calculator shall be permitted for practical examination. Statistical and Mathematical tables are to be provided to the students at the examination hall.

- Mathematics faculty alone should be appointed as examiners.

**Books for Reference**

1. Hogg, R.V. & Craig.A.T.(1998): Introduction to Mathematical Statistics, Macmillan.
2. Mood.A.M. , Graybill. F.A.& Boes.D.G.(1974) : Introduction to theory of Statistics, McGraw Hill.
3. Snedecor.G.W. & Cochran.W.G.(1967): Statistical Methods, Oxford and IBH
4. Hoel.P.G (1971): Introduction to Mathematical Statistics, Wiley.
5. S.C. Gupta & V.K. Kapoor: Fundamentals of Mathematical Statistics, Sultan &sons
6. S.C. Gupta & V.K. Kapoor: Fundamentals of Applied Statistics, Sultan & sons
7. Wilks . S. S. Elementary Statistical Analysis, Oxford and IBH
8. O. Kempthorne - Design of Experiments.

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