

## DEPARTMENT OF MATHEMATICS

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## 16UMT1MC01 ALGEBRA AND CALCULUS-I

**Semester:I**

**Credits :5**

**Category: MC**

**Hours/Week :5**

### **Objectives:**

1. To improve basics skills in calculus.
2. To improve skills in solving problems in theory of equations.

**Unit 1:** Leibnitz theorem and its applications-sub tangents and subnormal in cartesian and polar coordinates – slope of a curve and angle of intersection of curves in polar coordinates. (1+13+1 hrs)

**Unit 2:**Maxima and Minima of functions of two and three independent variables-Lagrange's method of undetermined multipliers (without Proof). (1+13+1 hrs)

**Unit 3:** Curvature-Radius of curvature in Cartesian and polar coordinates, centre of curvature, p-r equations-evolute-finding asymptotes of rational algebraic curves. (1+13+1 hrs)

**Unit 4:** Theory of equations- irrational roots and imaginary roots - relation between roots and coefficients - sum of the  $r^{\text{th}}$  powers of roots - reciprocal equations. (1+13+1 hrs)

**Unit 5:** Transformations-Descarte rule of signs- approximate solutions of polynomial by Horner's method-Cardon's method of solution of a cubic polynomial. (1+13+1 hrs)

### **Books for Study:**

- Narayanan, S. and Manickavachagam Pillai, T. K., Calculus- Vol I, S. Viswanathan Printers and Publishers, 1996. (Unit 1: Chapter 3: 1.1 – 1.5, 2.1

& 2.2, Chapter 9: 2, 4.1 – 4.5, Unit 2: Chapter 8: 4, 4.1 & 5, Unit 3 – Chapter 10: 2.1 – 2.8, Chapter 11: 1 – 4).

- Manickavachagam Pillai, T. K., Natarajan, T. and Ganapathy, K. S., Algebra- Vol I, S. Viswanathan Printers and Publishers, 1994. (Unit 4: Chapter 6: 1 – 11, 13, 14 & 16, Unit 5 – Chapter 6: 1-19, 24, 30 & 34.1.

### **Books for Reference:**

- Shanthi Narayanan, Differential calculus, S chand& co-2001.
- P.R.Vittal, Allied Mathematics, Margham publications-2005.
- Larry, C. Grove, Algebra, Dover Publications, e-book, 2012.
- Morris Kline, Calculus, Dover Publications, e-book, 2013.

## **16UMT1MC02 ANALYTICAL GEOMETRY OF 2D, TRIGONOMETRY AND MATRICES**

**Semester: I**

**Credits : 4**

**Category: MC**

**Hours/Week : 4**

### **Objectives:**

1. To bridge up the Mathematical skills between the higher secondary and the college level.
2. To refresh the basic concepts of trigonometry and matrices.
3. To improve analytical skills.

**Unit 1:** Expansions of  $\cos n\theta$ ,  $\sin n\theta$  and  $\tan n\theta$  - Powers of sines and cosines of  $\theta$  in terms of functions of multiples of  $\theta$ -expansion of  $\sin\theta$  and  $\cos\theta$  in a series of ascending powers of  $\theta$ .(1+10+1 HRS)

**Unit 2:** Hyperbolic functions-relation between hyperbolic and circular functions-Inverse hyperbolic functions-Logarithms of a complex number.  
(1+10+1 HRS)

**Unit 3:** Matrices – Cayley Hamilton theorem (without proof) – Eigen values and Eigen vectors – Diagonalization of matrices. (1+10+1 HRS)

**Unit 4:** Conics – pole and polar – chord in terms of midpoint – pair of tangents – conjugate diameters for ellipse. (1+10+1 HRS)

**Unit 5:** Asymptotes of hyperbola – rectangular hyperbola – polar equations of a line, circle and conic.  
(1+10+1 HRS)

### **Books for Study:**

Manickavachagam Pillai, T. K., Narayanan, S., Trigonometry, S. Viswanathan Printers and Publishers, 2007.

Unit 1 - Chapter 3 – Sections – 1,2,4,4.1,5,5.1

Unit 2 – Chapter 4 - Sections – 1,2,2.1 - 2.3

Chapter 5 – sections – 5,5.1,5.2

Manickavachagam Pillai, T. K., Natarajan, T. and Ganapathy, K. S., Algebra- Vol II, S. Viswanathan Printers and Publishers, 1994.

Unit 3 – Chapter 2 – Sections – 16,16.1 – 16.4

Manickavachagam Pillai, T. K., Natarajan., Analytical Geometry (part I), S. Viswanathan Printers and Publishers, 1996.

Unit 4 – Chapter 6 – Sections – 6,7,13

Chapter 7 – Sections – 15,16

Unit 5 – Chapter 8 – Sections – 8,10,10.1

Chapter 9 – Sections – 1 – 9.

**Books for Reference:**

- Duraipandian, P., Coordinate Geometry, Emerald Publishers, 1984.
- Abbotte, P., Wardle, M. E., Trigonometry, e-book, 2012.
- Heesterman, A. R., Matrices and their roots, A textbook of Matrix Algebra, e-book, 2013.
- Jain, P., Ahmad, K., Textbook of Analytical Geometry of Two Dimensions, e-book, 2014.

**16UPH1AL01 PHYSICS FOR MATHEMATICS – I**

**Semester: I** **Credits :3**

**Category: AL** **Hours/Week :6**

**Objectives:**

This paper is offered to the students of mathematics as allied required. To give a broader perspective of basic physics.

**Unit 1: Mechanics** (Introduction: 1 hr, Content: 6 hr, Revision: 1 hr)

**a) Particle dynamics:** Displacement, velocity and acceleration – distance – time graph – velocity – time graph – projectile motion – uniform circular motion – tangential acceleration in circular motion – relative velocity and acceleration

**b) Simple Harmonic Motion:** Formula for acceleration, velocity and displacement – oscillation in spring mass

system – potential and kinetic energy exchanges – springs in series and parallel – simple pendulum – energy method for period – oscillations of liquid in U – tube.

**Unit 2:** Gravitation (Introduction: 2 hr, Content: 8 hr, Revision: 2hr)

**a) Classical theory of gravitation :**Kepler’s laws, Newton’s investigation on planetary motion, Motion of moon round the earth – Newton’s law of gravitation – G and measurement – Boy’s method – Relation between g and G – Gravitational field strength.

b) Earth satellites – parking orbit – earth density – mass of the Sun –gravitational potential – velocity of escape – satellite potential and kinetic energy.

**Unit 3:** Properties of matter (Introduction: 2 hr, Content: 8 hr, Revision: 2 hr)

**a) Elastic properties :** Elastic limit – Hooke’s law – moduli of elasticity – Poisson’s ratio –relation between  $q, n, k$  – force in a bar due to contraction or expansion – energy stored in a wire – rigidity modulus – torsion in a wire –torsional oscillations method.

**b) Viscosity and surface tension :** Newton’s formula – Stoke’s formula – Poiseuille’s flow – molecular theory of surface tension – excess pressure over curved surface – spherical and cylindrical drops – surface energy – capillary rise – Quincke’s method for mercury.

**Unit 4:** Electronics (Introduction: 2 hr, Content: 8 hr, Revision: 2 hr)

**a) Operational amplifier:** ideal operational amplifier – CMRR – inverting and non– inverting amplifiers – summing amplifier – differential amplifier — solving simultaneous equations.

**b) Digital circuits:** J–K–Flip–Flop –Karnaugh map– 2, 3 and 4 variables – Full and half binary adders – Asynchronous counters.

**Unit 5:** Special theory of relativity (Introduction: 2 hr, Content: 8 hr, Revision: 2 hr)

Frames of reference – inertial frames and non– inertial frames –Galilean transformations – Michelson Morley experiment – interpretation of results – postulates of special theory of relativity – Lorentz transformation equations – length contraction – time dilation – transformation of velocities– variation mass with velocity – Mass –energy equation

**Books For Study:**

1. R.Murugesan, Allied Physics–Paper–I&II For B.Sc., Allied students of Madras University, S.Chand and Co., New Delhi, Revised and enlarged edition, 2010.
2. Nelkon and Parker, Advanced level physics, Arnold Publishers – 7th edition.
3. M.Narayanamurthy and N.Nagarathnam, Dynamics, The national publishers.
4. D.S.Mathur, Properties of matter, S.Chand and Co., New Delhi.
5. R.S.Sedha, A text book of applied electronics, S.Chand and Co., New Delhi, I edition, 1998.
6. Robert Resnick, Introduction to special relativity, Wiley Eastern.

**Books For Reference:**

1. D.Halliday and R.Resnick, Physics, Part 1, Wiley eastern.
2. Richard P. Feynman, Robert B. Leighton & Mathew Sands, Feynman lectures on physics series, vol. 1, 2 & 3, narosa publishing, New Delhi reprint 2006.



## 16UPH1AL02 PHYSICS FOR MATHEMATICS

### PRACTICAL– I

<b>Semester: I</b>	<b>Credits</b>	<b>:5</b>
<b>Category: AL</b>	<b>Hours/Week</b>	<b>:3</b>

#### LIST OF EXPERIMENTS

1. Young's modulus by stretching –vernier microscope
2. Rigidity modulus –torsional pendulum
3. Surface tension and interfacial tension – method of drops
4. Viscosity – capillary flow
5. Sonometer –Verification of laws
6. Compound bar pendulum – determination of 'g' and radius of gyration
7. Basic Gates – AND, OR, NOT, NAND, NOR
8. NAND, NOR as Universal Building Blocks

## 16UMT2MC01 ALGEBRA AND CALCULUS-II

<b>Semester: II</b>	<b>Credits</b>	<b>:5</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:5</b>

#### Objectives:

To introduce basics properties of integrals and to improve analytical skills

Unit 1: Definite integrals - properties of definite integrals - reduction formulae - area, volume, arc length and surface area in polar coordinates.

(1+13+1 hrs)

Unit 2: Multiple integrals – Change of order of integration – Change of variables – Jacobian.

(1+13+1 hrs)

Unit 3: Beta & Gamma integrals and their properties – relation between  $\beta$  and  $\gamma$  functions.

(1+13+1 hrs)

Unit 4: Convergence and divergence of series - comparison test - ratio test - Cauchy's root test – Raabe's test. (1+13+1 hrs)

Unit 5: Binomial, Exponential and Logarithmic series (without proofs) - application to summation.

(1+13+1 hrs)

### **Books for Study:**

Narayanan, S. and Manickavachagam Pillai, T.K., Calculus, Vol.II, S.Viswanathan Printers & Publishers, 2012. (Unit 1: Chapter 1: Pages 1-6, 66-74, 79-97, 123-126, 132-140, 144-151, Unit 2: Chapter 5 & 6: Pages 203-219, 251-269, Unit 3: Chapter 7: Section 2.1 – 2.3, 3, 4, 5).

Manickavachagam Pillai, T.K, Natarajan, T. and Ganapathy, K.S. Algebra, Vol I, S.Viswanathan Printers & Publishers, 2014. (Unit 4: Chapter 2: Pages 14-83, Unit 5: Chapter 3 & 4: Pages 99-120, 143-152, 188-230)

### **Books for Reference:**

Sanjay Mishra, Fundamentals of Mathematics – Trigonometry, Pearson Education; I Edition, e – book, 2014.

Shanthi Narayanan, Integral Calculus, S. Chand & Co., 2012.

Shanthi Narayanan, P. K. Mittal, Integral Calculus, S Chand; 35th Revised edition, e – book, 2005.

Vittal, P.R. Trigonometry, Margham Publications, 1988.

**16UMT2MC02 ANALYTICAL GEOEMTRY  
OF 3D, FOURIER SERIES AND NUMBER  
THEORY**

**Semester:II**                      **Credits**                                      **:4**

**Category: MC**                    **Hours/Week**                                      **:4**

**Objectives:**

To introduce basics in three dimensions and to improve analytical skills

Unit 1: 3D Geometry: Planes – Straight lines – the plane and the straight lines – Coplanar lines.

(1+10+1 Hrs)

Unit 2: Spheres: Definition – Equation of sphere – Equation of circle on a sphere – Equation of the tangent plane to the sphere.

(1+10+1

Hrs)

Unit 3: Periodic function – Even and odd function – Dirichlet's conditions – Convergence of Fourier series – Half range Fourier series.

(1+10+1 Hrs)

Unit 4: Theory of numbers - Euler's function  $\phi(N)$  - highest power of a prime contained in  $n!$ - Congruence's - Fermat's theorem-Wilson's theorem (Lagrange's theorem excluded).

(1+10+1 Hrs)

Unit 5: Inequalities - geometric and arithmetic means - Weirstrass inequality - Cauchy's inequality.

(1+10+1 Hrs)

**Books for study:**

- Manickavachagam Pillai, T.K, Natarajan,T. and Ganapathy,K.S. Analytical geometry, S.Viswanathan Printers & Publishers,1996.

(Unit 1: Chapters 1, 2 & 3: Pages 1-75, Unit 2: Chapter 4: Pages 92-114).

- Narayanan, S. and Manickavachagam Pillai, T.K., Calculus, Vol.III, S.Viswanathan Printers & Publishers, 2016. (Unit 3: Chapter 6: Pages 202-228).
- Manickavachagam Pillai, T.K, Natarajan,T. and Ganapathy,K.S. Algebra, Vol II , S.Viswanathan Printers & Publishers,2012. (Units 4: Chapter 5: Pages 218 -259, Unit 5: Chapter 4: Pages 179-208).

#### **Books for Reference:**

- Arumugam S, Issac A, Engineering Mathematics Vol I, Scitech Publications, 1999.
- Duraipandian, P., Coordinate Geometry, Emerald Publishers, 1984.
- SL Loney, The elements of Coordinate Geometry Cartesian Coordinates - Part - 1 Paperback, Arihant; Fifth edition, e – book, 2015.
- Sudarsan Nanda, Number Theory, Allied Publishers Pvt. Ltd.; 1 edition, e – book, 2013.

#### **16UCO2AL01 ACCOUNTING FOR DECISION MAKING**

<b>Semester:II</b>	<b>Credits</b>	<b>:3</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

#### **Objectives:**

1. To enable the students to prepare the financial statements of Individuals and partnership firms.
2. To inculcate the importance of ratio analysis.

3. To expose accounting treatment for estimation of cost to the students.
4. To familiarise students with the managerial applications of marginal costing.

### **Unit 1: Financial Accounting**

Preparation of journal, Ledger, Trial balance and Final Account – Trading Account, Profit and Loss Account and Balance Sheet with Elementary Adjustments.

### **Unit 2: Partnership Account**

Preparation of partners capital account, Profit and loss appropriation account, Accounting procedure for Admission of a partner- Treatment of goodwill– Revaluation account, Capital account and Balance sheet of reconstituted firm.

### **Unit 3: Ratio Analysis**

Liquidity Ratios – Current Ratio, Liquid/quick Ratios, cash to current assets Ratio, – Leverage Ratios – Debt Equity Ratios, Capital gearing Ratios, Proprietary Ratios, Turnover Ratios – Fixed Assets Turnover Ratio, Current Assets Turnover Ratio, Inventory Turnover Ratio, Working Capital Turnover Ratio, Debtors Turnover Ratio, Creditors Turnover Ratio.

### **Unit 4: Cost Estimation and Cost control**

Classification of cost by elements – Computation of costs – computation of profit, Treatment of stock – Tenders and Quotations.

### **Unit 5: Marginal Costing**

Marginal costing; meaning, advantages and limitations – Cost-Volume Profit Analysis – Break Even Analysis – Application of marginal costing in managerial decision making.

### **Course Text**

- R L Gupta & V K Gupta Financial Accounting, Tata McGraw Hill Publication, 2013.
- Murthy & Gurusamy, *Cost Accounting*, Tata McGraw Hill Publication, 2012.

### Course References

1. Maheswari S.N., *Principles of Cost Accounting*, Sultan Chand Publications, 2011.
2. Reddy T.S. & Hari Prasad Reddy Y., *Cost & Management Accounting*, Margam Publications, 2011.
3. T S Reddy & Murthy, *Financial Accounting*, Margam Publication, 2014.
4. Arora .M.N, *Cost Accounting*, Vikas Publishing House Pvt., 2011.

## 16UMT3MC01 INTEGRAL TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

<b>Semester: III</b>	<b>Credits</b>	<b>:6</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

### Objectives:

To develop of the skill of solving partial differential equations

To enable the students the applications of Laplace and Fourier transforms in differential equations.

Unit 1: Laplace transform: Laplace Transform of standard functions and periodic functions – Initial and Final value theorems.  
(1+16+1 hrs)

Unit-2: Inverse transform – Properties -Applications of Laplace transform to solution of the first and second

order linear differential equations (with constant coefficients), simultaneous equations  
(1+16+1 hrs)

Unit-3: Fourier transforms: Complex form of Fourier integral formula – Properties- convolution theorem.  
(1+16+1 hrs)

Unit-4: Fourier cosine and sine transforms – properties- Parseval's identity, Convolution Theorem.  
(1+16+1 hrs)

Unit-5: Formation of PDE, Complete integrals, Particular integrals, Singular integrals, equations solving by direct integration – the four standard types – Lagrange's equation – Charpit's method.  
(1+16+1 hrs)

**Book for Study:**

Narayanan, S. and Manicavachagom Pillay, T.K., Calculus, Vol.III, S. Viswanathan Printers and Publishers, 2009.

Unit 1: Chapter 5

Unit 2: Chapter 5.

Unit 3: Chapter 6 Sections 9-15.

Unit 4: Chapter 6 Sections 9-15

Unit 5: Chapter 5.

**Books for Reference:**

- S.Arumugam, A.Thangapandi, A.somasundaram, Engineering mathematics-II, Scitech Publications, 2001.
- Shanthi Narayanan, Integral Calculus, S. Chand & Co, 2014.
- P. R. Vittal, Allied Mathematics, Margham Publications, 2005.
- P. R. Vittal, Differential Equations and Laplace Transforms. Margham Publications, 2012.

## **16UMT3MC02 VECTOR ANALYSIS AND ORDINARY DIFFERENTIAL EQUATIONS**

<b>Semester: III</b>	<b>Credits</b>	<b>:6</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

### **Objectives**

- To enable students to understand the fundamental concepts of vector calculus and apply the various techniques of vector integration in solving volume and surface integrals.
- Gain logical skills in the formulation of differential equations
- Expose students to different techniques of finding solution to these equations.

Unit I: Vector Differentiation: Directional Derivative, Unit normal to the surface, equation of tangent plane to a surface, equation of normal to a surface, Divergence, Curl, Laplace operators. (1+13+1 hrs)

Unit II: Evaluation of line integral, Surface integral and volume integral. (1+13+1 hrs)

Unit III: Application of Green's theorem, Gauss – Divergence theorem, Stokes theorem (proofs of theorems not included), simple problems. (1+13+1 hrs)

Unit IV: Ordinary Differential Equations: Solutions of first order and first degree equations, Bernoulli's equation, Equations of first order but of higher degree, Clairaut's equation. (1+13+1 hrs)

Unit V: Linear Differential equations with constant coefficients, Variation of parameters, Linear equations with variable coefficients (Cauchy – Euler



equation), Equations reducible to the linear homogeneous equation (Legendre linear equations). (1+13+1 hrs)

Books for Study:

Duraipandian, P., LaxmiDuraipandian, Vector Calculus, Emerald Publishers, 2003.

Unit I: Chapter 2 – Sections 2.1 –2.8, Unit II: Chapter 3 – Sections 3.1 – 3.8, Unit III: Chapter 4 – Sections 4.1 – 4.8

Narayan, S. and Manickavachagam Pillai, T.K., Calculus, Vol.III, S. Viawanathan Printers & Publishers, 2016.

Unit IV: Chapter 1 – Sections 1.1 – 7.3,

Unit V: Chapter 2 – Pages 49-75, 81- 95.

**Books for Reference:**

1. HariKishan, Vector Algebra and Calculus, Atlantic, e – book, 2008.
2. S. Narayanan and T.K. Manickavachgam Pillai, Ancillary Mathematics, S. Viswanathan Printers, 1986, Chennai.
3. Ram Krishna Ghosh, Kantish Chandra Maity, Vector Analysis: [Vector Algebra and Vector Calculus], New Central Book Agency; 7th Revised edition, e – book, 2011.
4. Shanti Narayan, P. K. Mittal, A Text Book of Vector Analysis (English) 19th Edition, S.Chand Publishers, 2013.

**16UST3AL01 MATHEMATICAL STATISTICS – I**

<b>Semester: III</b>	<b>Credits</b>	<b>:3</b>
<b>Category: AL</b>	<b>Hours/Week</b>	<b>:6</b>

**Objective:**

To impart the statistical concepts and results with rigorous mathematical treatment.

UNIT – 1: Sample space – Events, Probability – Axiomatic, Classical, Statistical definition - Addition - Multiplication laws of probability – Independence – Conditional probability – Bayes theorem – Examples

UNIT – 2: Random Variables (Discrete and continuous), Distribution function – Expectation and moments – Moment generating function – probability generating function – Examples. Chebychev's inequality Bivariate Distribution – Marginal – Conditional distribution – Correlation Coefficient.

UNIT – 3: Binomial, Poisson, Hyper geometric, Normal and Uniform distributions – Geometric, Exponential, Gamma and Beta distributions, Transformation of random variables.

UNIT – 4: Order Statistics – Sampling distributions  $t$ ,  $\chi^2$ ,  $F$  - Sample mean – Sample variance – distributions.

UNIT – 5: Convergence in probability – convergence in distribution – Central limit theorem – Examples.

**Books for study:**

- Hogg R. V. & Craig A. T. 1988) : Introduction to Mathematical Statistics, Mcmillan.
- Bansilal and Arora (1989). New Mathematical Statistics, Satya Prakashan, New Delhi.

**Books for reference:**

- Gupta. S.C. & Kapoor, V.K. (2002). Fundamentals of Mathematical Statistics, Sultan Chand & Sons Pvt. Ltd. New Delhi

- Mood A. M & Graybill F. A & Boes D. G (1974)  
: Introduction to theory of Statistics, Mcgraw Hill.

### 16UMT4MC01 ABSTRACT ALGEBRA

<b>Semester:IV</b>	<b>Credits</b>	<b>:6</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

#### Objectives:

To introduce and develop abstract concepts and to understand the subject as a tool applicable to almost all other branches of science, engineering and technology.

Unit 1: Set Theory – Definition of a group – Some Examples of a Group – Some Preliminary Lemmas – Subgroups.

(2 + 14 + 2 hrs)

Unit 2: A counting principle – Normal Subgroups and Quotient Groups.

(2 + 14 + 2 hrs)

Unit 3: Homomorphism – Automorphisms – Cayley's Theorem – Permutation Groups.

(2 + 14 + 2 hrs)

Unit 4: Ring Theory – Definition and Examples of Rings – Some Special Classes of Rings – Homomorphism.

(2 + 14 + 2 hrs)

Unit 5: Ideals and Quotient Rings – More Ideals and Quotient Rings – Euclidean Rings – A Particular Euclidean Rings.

(2 + 14 + 2 hrs)

#### Book for Study:

I. N. Herstein, Topics in Algebra, Wiley India (P) Ltd., New Delhi, Second Edition, 2014.

Unit 1: Chapter 1, 2 – Sectons-1. 1, 2.1 – 2. 4

Unit 2: Chapter 2 – Sectons-2.5 – 2. 6

Unit 3: Chapter 2 – Sectons-2. 7(Application 2 and Corollary Excluded) – 2. 9 (Exclude theorem 2.9.2 and lemma 2.9.1), 2. 10

Unit 4: Chapter 3 – Sectons-3.1 – 3.3

Unit 5: Chapter 3 – Sectons-3.4 – 3.5, 3.7 - 3.8

**Books for Reference:**

Arumugam S. and Issac A. T., Modern Algebra, SciTech publications (India) Pvt. Ltd., 2006.

Charles C. Pinter, A Book of Abstract Algebra, Dover Publications, Second Edition, e-Book, 2015.

DipakChatterjee, Abstract Algebra, PHI Learning, Third Edition, e-Book, 2015.

Joseph A Gallian, Contemporary Abstract Algebra, Cengage Learning, 2013.

Santiago M. L, Modern Algebra,Tata McGraw – Hill, 2001.

Vekatachalapathy S. G.,Modern Algebra,Margham publications, 2003.

**16UMT4ES01 COMBINATORICS**

<b>Semester:IV</b>	<b>Credits</b>	<b>:4</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

**Objectives:**

1. To introduce to the student the branch of Discrete Mathematics that deals with enumeration and existence problems.
2. To help students to face questions on Discrete Mathematics in various competitive examinations.

**Unit 1:**

Introduction to basic ideas-general formula for  $f(n, k)$ -  
Recurrence relation-boundary condition-Fibonacci  
sequence-generating function.(1+15+2 hrs)

**Unit 2:** Permutation-ordered selection-unordered  
selection-further remarks on Binomial theorem.  
(1+15+2 hrs)

**Unit 3:** Passing within a set-Pairing between sets and  
optimal assignment problem-Gale's optimal assignment  
problem. (1+15+2 hrs)

**Unit 4:** Fibonacci type relation-using generating  
function-miscellaneous method. (1+15+2 hrs)

**Unit 5:**

The inclusion-exclusion principle-Rook  
polynomial.(1+15+2 hrs)

**Book for Study:**

Ian Anderson, A First course in combinatorial  
mathematics, Clarendon Press-Oxford, Second edition,  
1989.

Unit-1 Chapter 1

Unit-2 Chapter 2: 2.1-2.5

Unit-3 Chapter 3: 3.1-3.4

Unit-4 Chapter 4: 4.1-4.3

Unit-5 Chapter 5: 5.1-5.2.

**Books for References:**

- V.K. Balakrishnan, Combinatorics, Schuam Series, 1996.
- George Duckett, Combinatorics: Questions and Answers, e-Book, 2015.

- Lint, J.H. Van and Wilson, R.M., A course in Combinatorics, Cambridge University Press, Second Edition, Reprinted 2007.
- Stefan Hollos and J. Richard Hollos, Combinatorics Problems and Solutions Abrazol Publishing, e-book, 2013.

## 16UMT4ES02 FUZZY SETS AND APPLICATIONS

<b>Semester:IV</b>	<b>Credits</b>	<b>:4</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

### Objective:

- To get familiarized with Fuzzy principles and appreciate its nuances by contrasting with crisp set principles.
- To apply fuzzy tools in real world problems with some examples from recent research publications.

**Unit 1:** Introduction- The need for fuzzy approach- Crisp sets – Set properties and operations- Fuzzy Subsets- Membership values - Fuzzy Subset operations- Difference between Fuzzy subsets and Crisp sets. Relations- Mappings – Fuzzy relations- important properties – Composition of two Fuzzy relations - Variation between ordinary relations and fuzzy relations. Logic – Fuzzy Logic and the difference.

Survey on the historical development of fuzzy principles and fuzzy logic applications.

**Unit 2:** Matrices – Matrix types and operations – Neurons- Neural Networks- Synoptic Model- Relational representations in matrix forms- Fuzzy causal relations and its representation in matrix format-Simple applications.

**Unit 3:** Different fuzzy models – Bidirectional Associative Memories (BAM) –Fuzzy Cognitive Maps (FCM) and its variations.

**Unit 4:** Fuzzy Relational Maps (FRM) and its variations – Their Induced Models. Simple applications

**Unit 5:** Graphs- Fuzzy Graphs – Simple applications - Numbers – Fuzzy numbers – Different types of fuzzy numbers – Simple Applications.

**Books for study:**

A. Kauffman, Introduction to the Theory of Fuzzy Subsets, Academic Press, INC, New York. 1975.

Unit 1: Chapter: 1- Section: 1-9. Chapter: 2- Section: 12-17, 19-26.

Unit II: Chapter 3; 191-264.

Bart Kosko ,Neural Networks and Fuzzy Systems , Printice-Hall, INC., New Jersey, 1992.

Unit II: Chapter-2. Chapter-3 : 79-92, Chapter-8 :299-308.

Unit III and IV: Chapter 3 (Pg. No: 79-84), Chapter 4 (Pg.No: 152-158) and Chapter 8 (Pg. No: 299-307).

Neural Networks and Fuzzy Systems: A Dynamical Systems Approach to Machine Intelligence – Bart Kosko, Prentice Hall, New Jersey, 1992.

Unit V: Chapter 2 (Pg. No: 19-70) and 3(Pg. No: 108-111, 120-123).

4. Fuzzy Graphs and Fuzzy Hypergraphs – John N. Mordeson, Premchand S. Nair, Physica-Verlag, Springer Verlag Publisher, USA, 2000.

Unit V: Chapter 2 (Pg. No: 45-73) and 5 (Pg. No: 127-142).

6. Fuzzy Sets and Fuzzy Logic: Theory and Applications – George J Klir and Bo Yuan, Printice-Hall, INC., New Jersey 2002.

Unit V: (Chapter-4, pp: 97-117).

7. Applied Fuzzy Arithmetic, An Introduction with Engineering Applications – Michael Hanss, Springer Publishers, Stuttgart, Germany, 2005.

## 16UST4AL01 MATHEMATICAL STATISTICS – II

<b>Semester:IV</b>	<b>Credits</b>	<b>:3</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

### Objective:

1. To impart the statistical concepts and results with rigorous mathematical treatment.
2. To enable the real-life applications of Statistics

UNIT – 1 : Point estimation - Unbiasedness, consistency, and sufficiency – Factorisation theorem(without proof) -Methods of estimation : Maximum likelihood – Method of moments

UNIT – 2: Cramer Rao inequality - Efficiency - Rao Blackwell theorem, UMVUE, Interval estimation – Confidence intervals.

UNIT – 3: Tests of Hypothesis – Type I and Type II Errors – power – Best critical region –Neyman Pearson lemma – Applications. Monotone likelihood ratio property – applications – Likelihood ratio tests.

UNIT – 4 : Tests for significance – one sample - two sample problems - mean proportion – variance – contingency tables – one way ANOVA – Two way ANOVA – Non parametric method – Wilcoxon Mann Whitney



UNIT – 5 : Simple linear regression: The least squares method – Multiple linear regression (without proof)  
Sampling – simple random – stratified sampling – systematic sampling(without proof)

**Books for study :**

- Hogg R. V. & Craig A. T. 1988) : Introduction to Mathematical Statistics, Mcmillan.
- Bansilal and Arora (1989). New Mathematical Statistics, Satya Prakashan, New Delhi.

**Books for reference:**

- Gupta. S.C. & Kapoor, V.K. (2002) . Fundamentals of Mathematical Statistics, Sultan Chand & Sons Pvt. Ltd. New Delhi
- Mood A. M & Graybill F. A & Boes D. G (1974) : Introduction to theory of Statistics, Mcgraw Hill.

**16UMT5MC01 REAL ANALYSIS**

<b>Semester:IV</b>	<b>Credits</b>	<b>:6</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

**Objectives:**

- The primary objective of teaching Real Analysis is to make the students think logically and objectively.
- The secondary objective is to impart rigorous mathematical training.

Unit 1: The real number system - Ordered field –The real line and intervals – Integers – Rational and irrational number – Absolute values and inequalities- Sequences- Minkowski’s inequality – Similar sets – Finite and infinite sets – Countable and uncountable sets.  
(1+16+1 hrs)

Unit 2: Metric spaces – Euclidean space  $\mathbb{R}^n$  – Point set topology in metric spaces-Bolzano- Weierstrass theorem for  $\mathbb{R}^1$ -Compact sets.  
(1+16+1 hrs)

Unit 3: Convergent sequences and their limits – Cauchy sequence and complete metric spaces- Limits of a function- Continuous functions- Function continuous on compact sets-Uniform continuity.  
(1+16+1 hrs)

Unit 4: Definition of derivative – Differentiability and continuity – Algebra of derivatives and the chain rule – One sided derivatives – Local maxima and minima- Some classical theorems of differential calculus.  
(1+16+1 hrs)

Unit 5: Monotonic functions – Functions of bounded variation. (1+16+1 hrs)

**Book for Study:**

Real Analysis ,K.ViswanathaNaik, Emerald Publishers, 1992.

Unit 1: Chapter 1- Sections- 5-8, 10, 11, 13-15.

Unit 2: Chapter 2- Sections- 2,3, 4,6,7.

Unit 3: Chapter 3- Sections- 2, 8.

Unit 4: Chapter 4- Sections- 2-7.

Unit 5: Chapter 5- Sections- 2,3.

**Books for Reference:**

- Tom M.Apostol, Mathematical Analysis, Addison Wesley publishing company, California, 1981
- Richard R.Goldberg , Methods of Real Analysis , Oxford and IBH publishing Co.Pvt.,Ltd., 1976.

- N.L. Carathéodory, Real analysis, Cambridge university press, Fifth edition, digital printing e-Book 2006.
- Lara Alcock, How to think about analysis, Oxford university press, first edition, e-Book 2014.

## 16UMT5MC02 STATICS

<b>Semester:IV</b>	<b>Credits</b>	<b>:6</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

### Objectives:

1. To give the students a practical knowledge of statics; its uses and application in day to day life.

### Unit 1: Concurrent system of forces

Forces acting on a particle-concurrent forces-equilibrium of forces acting at a point-parallelogram law of forces-triangle law of forces-Lami's theorem-polygon of forces-conditions of equilibrium in three dimensional cases with problems related to the plane.(2+14+2 hrs)

### Unit 2: Parallel forces, moments and couples

Moments-parallel forces-couples-moments of a force about a point and a line-theorems on moments-resultant of like and unlike parallel forces-couples-reduction of a force and couple in a plane to a single force-varignon's Th on moments, Centre of parallel force (2+14+2 hrs)

### Unit 3: Centre of gravity

Centre of gravity of curves, areas, surfaces and volumes of solids of revolution-location of the centre of gravity of standard configurations.  
(2+14+2 hrs)

### Unit 4: Principle of virtual work and stability

Conditions of equilibrium- virtual work- simple problems- equilibrium of bodies- stability of a body with one point fixed- stability of a body rolling over a fixed body. (2+14+2 hrs)

### **Unit 5: Catenary**

Equilibrium of strings and chains- common catenary- suspension bridge-flexible cable resting on a plane curve.

(2+14+2 hrs)

### **Books for Study:**

K.V. Naik and M.S. Kasi, Statics, Emerald publishers, First published, 1987

Unit 1- Chapter-II (2.1 – 2.9, 2.12-2.15, 2.17)

Unit 2: Chapter-III (3.1-3.4, 3.6-3.9)

Unit 3: Chapter-V (5.1- 11, 5.16)

Unit 4: Chapter –VI and VII 6.1-7,6.10,7.1-7.4

Unit 5: Chapter VIII ( 8.1-8.4)

### **Books for References:**

- M.K. Venkataraman, Statics, Agastiar Publishers, Seventh edition, 1994.
- D. S. Kumar, Statics & Dynamics, S.k. Kataria & sons, 2013.
- Russell C. Hibbeler, Statics & Dynamics, Prentice hall Publishers, Tenth Edition, 2003.
- Engineering mechanics Statics, Russele.Hibbeler, Publisher Cram 101, 12 edition, e – Book, 2013.
- Statics with matlab, Dan B, Marghitu, MihaiDupae, Nels.H.Madoeu, Springer, e – Book, 2013.

## 16UMT5MC03 LINEAR ALGEBRA

<b>Semester:V</b>	<b>Credits</b>	<b>:6</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

### Objectives:

To study vector space as an abstract algebraic system and establish some of the properties of such system.

**Unit 1:** Vector Spaces – Elementary Basic Concepts – Linear Dependence and Bases –  $\text{Hom}(V, W)$  – dimension  $\text{Hom}(V, W)$ .

(1 + 16 + 1 hrs)

**Unit 2:** Inner Product Spaces – Schwarz Inequality – Orthogonal Space – Gram Schmidt orthogonalization process.

(1 + 16 + 1 hrs)

**Unit 3:** The Algebra of linear transformations – Characteristic Roots.

(1 + 16 + 1 hrs)

**Unit 4:** Matrices – Canonical Forms: Triangular Forms.

(1 + 16 + 1 hrs)

**Unit 5:** Hermitian, Unitary and Normal Transformations.

(1 + 16 + 1 hrs)

### Book for Study:

I. N. Herstein, Topics in Algebra, Second Edition, Wiley India (P) Ltd., New Delhi, 2014.

Unit 1: Chapter 4 – Sections - 4.1, 4.2, 4.3 Pages 184 - 186

Unit 2: Chapter 4 – Sections - 4.4

Unit 3: Chapter 6 – Sections - 6.1, 6.2

Unit 4: Chapter 6 – Sections - 6.3, 6.4

Unit 5: Chapter 4 – Sections - 6.10

**Books for Reference:**

- S. Arumugam and A. T. Issac, Modern Algebra, SciTech Publications (India) Pvt. Ltd., 2006.
- Devi Prasad, Elementary Linear Algebra, Second Edition, Narosa Publishing House, 2012.
- Gopalakrishnan N S, University Algebra, New Age International (P) Ltd., Third Edition.
- Kumaresan S, Linear Algebra, prentice-Hall of India Pvt. Ltd., 2009.
- Peter Petersen, Linear Algebra (Undergraduate Texts in Mathematics), Springer, e-Book, 2012.
- M. L. Santiago, Modern Algebra, Tata McGraw – Hill, 2001.
- Stephen H Friedberg, Arnold J Insel, Lawrence E. Spence, Linear Algebra, Pearson, Fourth Edition, e-Book, 2013.

**16UMT5ES01 DATA STRUCTURES AND ALGORITHMS**

<b>Semester:V</b>	<b>Credits</b>	<b>:4</b>
<b>Category: ES</b>	<b>Hours/Week</b>	<b>:6</b>

**Objectives:**

- This language independent data structures enable students to design algorithms using pseudocode and then build them into programs.
- Learn the basic techniques to collect and analyze the data in respective project.

**Unit 1:** Pseudocode - Algorithm analysis - pseudocode examples - Abstract Data Type (ADT) – Model for an ADT – Algorithmic Efficiency. (1+15+2 hrs)

**Unit 2:** Searching – List searches - sequential search - sentinel search, probability search, ordered list search - Binary search. (1+15+2 hrs)

**Unit 3:** Linear lists - linked lists - linked list algorithms (Create node, insert node, delete node algorithms only) – Basic Stack operations – Stack Applications - Reversing data, Backtracking. (1+15+2 hrs)

**Unit 4:** Queues - operations - Recursion - Examples (Factorial, Fibonacci numbers algorithms only) - Tree - Basic tree concepts - Binary tree. (1+15+2 hrs)

**Unit 5:** Sorting concepts - Insertion sort - Selection sort - Heap sort - Bubble sort. (1+15+2 hrs)

**Book for Study:**

Richard F. Gilberg and Behrouz A. Forouzan - Data Structures A Pseudocode approach with C - Brooks/Cole Publishing Company, Second Edition 2005.

Unit 1: Sections: 1.1, 1.2, 1.3 1.6.

Unit 2: Sections: 13.1.

Unit 3: Sections: 3.1, 3.5 and Sections: 5.1, 5.2.

Unit 4: Sections: 4.1, Section: 2.1 and Sections: 6.1, 6.2.

Unit 5: Sections: 12.1, 12.2, 12.3, 12.4.

1. Ellis Horowitz and Sartaj Sahani – Fundamentals of Data Structure in PASCAL – Galgotia Publ, 1996.
2. Trembley and Sorenson – Data structures with applications – TMH- 3<sup>rd</sup> Edition, 1991.

3. Advanced Data Structures, Peter Brass, Cambridge University Press, e – Book, 2008.
4. Data Structures and problem solving, Mark.A.Weiss, Pearson 4 edition, e – Book, 2013.

### 16UMT5ES02 ASTRONOMY

<b>Semester:V</b>	<b>Credits</b>	<b>:4</b>
<b>Category: ES</b>	<b>Hours/Week</b>	<b>:6</b>

#### Objectives

- To introduce the students to space science.
- To familiarize the student with the important features of the planets, sun , moon and stellar universe.

Unit 1: Spherical trigonometric formulae ( without proof) – systems of coordinates – diurnal motion of the sun and stars – sidereal day – sidereal time – circumpolar stars – morning and evening stars – celestial diagram. Zones of earth – variations in the durations of day and night – dip – twilight. (1+16+1hrs)

Unit 2: Refraction – parallaxes – aberration of light – effect of parallax on celestial latitude and longitude. Instruments – sextant – telescope – meridian circle – equatorial – sundial. (1+16+1hrs)

Unit 3: Kepler’s laws – verifications of first law – Newton’s deductions – conversion of time – equation of time – seasons – calendar. (1+16+1hrs)

Unit 4: Moon – synodic and sidereal periods – Moon’s phases – description of Moon’s surface.Eclipses – lunar and solar eclipses – different kinds of eclipses – ecliptic limits – maximum and minimum number of eclipses in a year. (1+16+1hrs)



Unit 5: Universe: Origin of universe – Solar system – Birth and Death of stars – Black holes. Practical Astronomy: Constellation of stars- Planets- Galaxies. (1+16+1hrs)

**Book for Study:**

S.Kumaravelu , Astronomy for degree classes, Mission Press, Palayamkottai. 1967.

Unit 1: pages 1- 153.

Unit 2: pages 277-293.

Unit 3: pages 191-195, 200-2001, 220-262.

Unit 4: pages 372-373, 375-396,397-433.

Unit 5: pages 511-564,565-600.

**Books for Reference:**

1. RukmaniRamachandran ,Astronomy for graduate & post graduate classes, Trichirapally, 1968.
2. John Scalzi, The rough guide to universe, Rough guides ltd, London. 2009.
3. Sir Patrick Moore updated by Percy Seymour, Patrick Moore's Astronomy, Teach yourself,e-Book2010.
4. Dinah . I. Moche, Astronomy- A self teaching guide, John Wiley & sons Inc, e-Book2015.

**16UMT5SK01 NUMERICAL METHODS USING C**

<b>Semester:V</b>	<b>Credits</b>	<b>:6</b>
<b>Category: SK</b>	<b>Hours/Week</b>	<b>:6</b>

**Objective:**

To find numerical solutions to problems where the exact relationship between the variables are not known.

Unit 1: Solutions to simultaneous linear equations - Gaussian elimination – Gauss-Seidel iterative method. (1+9+1hrs)

Unit 2: Bisection method – Newton-Raphson method – Successive approximation method – RegulaFalsi method. (1+9+1hrs)

Unit 3: Interpolation with equal and unequal intervals – Newton's Forward interpolation formula – Newton's Backward interpolation formula – Divided difference formula - Lagrange's interpolation formula. (1+9+1hrs)

Unit 4: Central difference interpolation formula– Gauss interpolation formula – Stirlings formula –Bessel's formula – Everett's formula (Only application of these formulae. No proof required). Numerical differentiation. (1+9+1hrs)

Unit 5: Numerical integration – Trapezoidal rule – Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rule for numerical integration. Numerical solutions of ordinary differential equations- Euler's methods with its modifications – Taylor's series method –Runge- Kutta method. (1+9+1hrs)

**Book for study:**

Dr.V.N.Vedamurthy, Dr.N.Ch.S.N.Iyengar ,Numerical Methods , Vikas Publishing house pvt.Ltd. 1998.

UNIT 1: Chapter: 4- Section: 2,10

UNIT 2: Chapter: 3- Section: 2-5

UNIT 3: Chapter: 6- Section: 2,3. Chapter 8 - Section: 1-5

UNIT 4: Chapter: 7- Section: 2,3,6,8. Chapter 9- Section 1-4

UNIT 5: Chapter: 9- Section: 6,8,9,10. Chapter 11- Section:4,5,6,10, 11,12,14,15.

### **Books for Reference:**

1. E.V. Krishnamurthy & S.K. Sen., Numerical Algorithms computations in Science & Engineering, Affiliated East- West Press pvt. Ltd. 1994.
2. Kandasamy.P, Numericals methods, Sultan and sons private ltd, 1997.
3. Manish Goyal, Numerical Methods and Statistical Techniques Using C, Lakshmi publication 2009
4. Numerical Methods for engineers D.Vaughan Griffiths, I.M.Smith, Chapman & hall / CRC, 2nd edition, e – Book, 2006.
5. Numerical Methods, Babu Ram, Pearson, 1 edition, e – Book, 2010.

### **16UMT5SK02 NUMERICAL METHODS USING C-LAB**

#### **Objective:**

To apply C programming to find numerical solutions to problems.

#### **Programs:**

Gauss Elimination Method

Newton Raphsons method

program for Newton Raphson general

Trapezoidal Method in C

Simpson 1/3 Rule in C

Simpson 3/8 Rule of Numerical Integration C Program

Euler's Method in C

Runge-Kutta Method in C

Runge-Kutta Second Order in C Programming

## RegulaFalsi Method in C

### Books for Reference:

1. Manish Goyal, Numerical Methods and Statistical Techniques Using C, Lakshmi publication 2009
2. Numerical Methods for engineers D.Vaughan Griffiths, I.M.Smith, Chapman &hall / CRC, 2nd edition, e – Book, 2006.

### 16UMT6MC01COMPLEX ANALYSIS

<b>Semester:VI</b>	<b>Credits</b>	<b>:6</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

### Objectives:

To prepare the students on the basic concepts in complex analysis.

Unit 1: C – Character set – constants – variables and arithmetic expressions. Basic structure of a C program. Operators – pre processor directives – library functions. Mathematical library function, string – handling functions – input and output functions. (2 + 14 + 2 hrs)

Unit 2 :Control statements – decision making statements – if, if ... else, go to, switch case, break and continue statements. Arrays one-dimensional and two dimensional arrays – user defined functions – recursion basic file handling concepts. (2 + 14 + 2 hrs)

Unit3: Solutions to simultaneous linear equations - Gaussian elimination – Gauss-Seidel iterative method. Bisection method – Newton-Raphson method – Successive approximation method – RegulaFalsi method. (2 + 14 + 2 hrs)

Unit 4: Numerical integration – Trapezoidal rule – Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rule for numerical integration.  
(2 + 14 + 2 hrs)

Unit 5: Numerical solutions of ordinary differential equations- Euler's methods with its modifications – Taylor's series method – Runge- Kutta method.  
(2 + 14 + 2 hrs)

**Book for Study:**

James Ward Brown, Ruel V Churchill, Complex Variables and Application, McGraw-Hill Education (India) Private Limited, Eighth Edition, 2014.

Unit 1: Chapter 2 - pages 35 – 42, 45 – 48, 50 – 81.

Unit 2: Chapter 4 - pages 117 – 132, 137 – 168.

Unit 3: Chapter 4, 5 - pages 172 – 178, 189 – 205.

Unit 4: Chapter 6, 7 - pages 229 – 237, 240 – 257, 261 – 272, 288 – 291.

Unit 5: Chapter 7, 8, 9 - pages 291 - 298, 311 – 314, 319 – 322, 325 – 330, 355 – 358, 363 – 365.

**Books for Reference:**

- Arumugam S., ThangapandiIsaac A., Somasundaram A., Complex Analysis; Scitech Publications (India), 2015.
- Edward Saff, Arthur D. Snider, Fundamentals of Complex Analysis: with Applications to Engineering and Science, Pearson, Third Edition, e-Book, 2014.
- ITL Esl, Complex Analysis, Pearson, First Edition, e-Book, 2012.
- Ponnusamy S., Foundations of Complex Analysis, Narosa Publishing House, 2011.
- Sharma J. N., Functions of a Complex Variable, Krishna Prakashan Media (P) Ltd., 2014.

## 16UMT6MC02 DYNAMICS

<b>Semester:VI</b>	<b>Credits</b>	<b>:6</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

### **Objectives**

To enable the learner to apply the principles of Dynamics in daily life.

### **Unit 1: Laws of motion**

Momentum-Newton's laws of motion-illustration of Newton's laws of motion-conservation of linear momentum-motion of a particle on a rough horizontal plane under the action of a constant force- motion of a particle up a rough inclined plane under the action of a constant force-pressure of body resting on a moving horizontal plane- motion of connected particles-Atwood's machine. (2+14+2 hrs)

### **Unit 2: Projectile**

Trajectory-ranges on horizontal and inclined planes-enveloping parabola. (2+14+2 hrs)

### **Unit 3: Simple harmonic motion**

Simple harmonic motion and its application to the case of a particle attached to the end of an elastic string-composition of two simple harmonic motions-simple harmonic motion on a curve-simple pendulum. (2+14+2 hrs)

### **Unit 4: Central forces**

Central orbits-velocity and acceleration in polar coordinates-circular, elliptic, parabolic and hyperbolic orbits-problems to find out the orbit when the law is given and conversely-inverse square law-Kepler's laws. (2+14+2 hrs)

## **Unit 5: Moment of inertia**

Theorems on parallel axes and perpendicular axes-product of inertia-moment of inertia of regular bodies.  
(2+14+2 hrs)

### Books for Study

K.V. Naik and M.S. Kasi, Dynamics, Emerald publishers, First edition, 1987

Unit 1: Chapter-II (2.1- 2.5, 2.8- 2.11)

Unit 2: Chapter –V (5.1-5.6)

Unit 3: Chapter-VIII (8.1, 8.2, 8.4, 8.5)

Unit 4: Chapter-X (10.1- 10.8, 10.11)

Unit 5: Chapter XI (11.1- 11.12)

### **Books for References:**

1. V. Dharmapadam, Dynamics, Viswanathan Publishers, First edition, 1972.
2. D. S. Kumar, Statics & Dynamics, S.k. Kataria& sons, 2013.
3. Russell C. Hibbeler, Statics & Dynamics, Prentice hall Publishers, Tenth Edition 2003.
4. S. Narayanan, classical Dynamics, Viswanathan Publishers, First edition, 1989.
5. An Introduction to Mechanics, DawielKeleppker, Robert J.Kolenkow, Cambridge University Press, e – Book, 2010.
6. Mechanics, J.P. Den Hartog, Dover Publication, e – Book, 2013

## 16UMT6MC03 DISCRETE MATHEMATICS

**Semester: VI**                      **Credits**    **:6**  
**Category: MC**                      **Hours/Week**    **:6**

### **Objectives:**

1. To equip the students with mathematical tools that has applications in various fields.
2. To enable students to develop construction and verification of mathematical logic.
3. To gain fundamental knowledge about lattices and Boolean algebra.

**Unit1:** Statements and Notations, Connectives, Negation, Conjunction, Disjunction, Statement Formulae and Truth Tables, Conditional and Bi-conditional, Well-formed Formulae, Tautologies, Equivalence of Formulae, Duality Law Tautological Implications.  
(2+14+2 Hrs)

**Unit2:** Normal Forms, Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Disjunctive Normal Forms, Principal Conjunctive Normal Forms, Rules of Inference, The Predicate Calculus, Predicates, Variables and Quantifiers, Predicate Formula, Free and Bound Variables.  
(1+15+2 Hrs)

**Unit3:** Semigroups, Monoids, Homomorphism of Semigroups and Monoids, Sub semigroups and Submonoid.  
(2+14+2 Hrs)

**Unit4:** Lattices as Partially Ordered Set, Properties of Lattices, Lattices as Algebraic Systems, Sub lattices, Direct Product and Homomorphism.  
(2+14+2 Hrs)



**Unit5:** Boolean Algebra, Basic properties, Subalgebra, Direct Product, and Homomorphism, Boolean Functions.  
(1+15+2 Hrs)

**Book for study:**

J.P.Trembley, R. Manohar Discrete Mathematical Structures with applications to Computer science, McGrew HillBook Co.,second edition2001.

Unit1-Chapter1:1.1,1.2.1-1.2.4,1.2.6-1.2.11

Unit2-Chapter1:1.3.1-1.3.4,1.4.1-1.4.3,1.5.1-1.5.4

Unit3-Chapter3: 3.2.1-3.2.3

Unit4-Chapter4: 4.1.1-4.1.4

Unit5-Chapter4: 4.2-4.3.

**Books for reference:**

1. N. Chandrasekaran and M. Umavarvathi, Discrete Mathematics, Prentice Hall of India, e-Book, 2013.
2. R.LidlandG.Pilz, Applied Abstract Algebra, SpringerVerla, 1984.
3. RalphP.Grimaldi, Discrete and combinatorial Mathematics: An Applied Introduction, Fourth edition, Pearson Education Asia, Delhi 2002.
4. Uday Singh Rajput, Advanced Discrete Mathematics, Prentice Hall of India, e-Book, 2012.

**16UMT6MC04 GRAPH THEORY**

<b>Semester:VI</b>	<b>Credits</b>	<b>:6</b>
<b>Category: MC</b>	<b>Hours/Week</b>	<b>:6</b>

**Objectives:**

To translate real life situations to diagrammatic representations and develop problem solving skills and thereby solve real life problems.

**Unit 1:** Graphs – Applications of graphs – finite and infinite graphs – Incidence and degree – Isomorphism – Sub graphs – Walks, paths and circuits – connected graphs, disconnected graphs and components.

(2+15+1 hrs)

**Unit 2:** Euler Graphs – Operations on Graphs – More on Euler Graphs – Hamiltonian paths and circuits.

(1+16+1 hrs)

**Unit 3:** Trees – some properties of Trees – Pendant vertices in a Tree – Distance and centers in a Tree – Spanning Trees – Spanning Trees in a weighted Graph.

(1+16+1 hrs)

**Unit 4:** Cut-sets – some properties of cut-sets – All cut-sets in a Graph – Fundamental circuits and cut-sets – connectivity and separability.

(1+16+1 hrs)

**Unit 5:** Planar Graphs – Kuratowski's Graphs – Different representations of a planar Graph – Chromatic Number and chromatic polynomials – Directed graph – some types of digraphs. (1+16+1 hrs)

**Book for Study:**

NarsinghDeo, Graph Theory with applications to Engineering and Computer Science, Prentice Hall of India, Publications 2004.

Unit 1: Chapter 1,2 - Sections – 1.1,1.2,1.3,1.4,2.1,2.2,2.4,2.5

Unit 2: Chapter 2 - Sections – 2.6,2.7,2.8,2.9

Unit 3: Chapter 3 - Sections – 3.1,3.2,3.3,3.4,3.7,3.10

Unit 4: Chapter 4 - Sections – 4.1,4.2,4.3,4.4,4.5

Unit 5: Chapter 5 - Sections – 5.2,5.3,5.4,8.1, 8.3, 9.1, 9.2

### **Books for Reference:**

- AmitSinha, Suneet Gupta, Graph Theory, Acme Learning Private Limited, First Edition, e-book, 2012.
- S. Arumugam and S. Ramachandran, Invitation to Graph theory, SciTech publications, 2015.
- R. Balakrishnan, K. Ranganathan, A Textbook of Graph Theory, Springer, Second Edition, 2012.
- G. Suresh Singh, Graph Theory, PHI Learning, e-book, 2010.
- UditAgarwal, Umesh Pal Singh, Graph Theory, University Science Press, 2009.

## **16UMT6MS01 OPERATIONS RESEARCH**

**Semester:VI**  
**Category: MS**

**Credits:6**  
**Hours/Week:6**

### **Objectives:**

To provide a scientific basis to the decision makers for obtaining optimal solution.

**Unit 1:** Linear programming – Graphical solution – Simplex algorithm –Big M method- Dual and primal techniques – Dual simplex method.  
(2+15+1hrs)

**Unit 2:** Transportation –Balanced and Unbalanced problems – Assignment Problem – Balanced and Unbalanced problems. (2+15+1hrs)

**Unit 3:** Theory of Games – Optimal solutions of two persons zero-sum games – Mixed strategies – Solutions by graphical method – Solutions of m x n games by graphical method – Dominance principle.  
(2+15+1hrs)

**Unit 4:** Network Analysis – Network definitions – Shortest - route problem – Minimal spanning tree problem –Maximal flow problem – Project scheduling by PERT-CPM . (2+15+1hrs)

**Unit 5:** Inventory models: Introduction – Deterministic models- single item static models with and without shortages- Single item static model with single price break- Quantity discounts. (2+15+1hrs)

Practical's: Programs using TORA, Win QSB software.

**Books for Study:**

- Hamdy A. Taha, Operations Research - An Introduction, Pearson, Seventh edition, 2014.
- Unit 4: Chapter 6-Sections-6.1, 6.2, 6.3,6.3.1, 6.4, 6.4.1, 6.4.2, 6.6, 6.6.1, 6.6.2
- J K Sharma, Operations Research Theory & Applications, Macmillan Publications, India, Third edition, 2007.

Unit 1: Chapter 3,4,5-Sections -  
3.1,3.2,3.3,4.1,4.2,4.3,4.4,5.1,5.2

Unit 2: Chapter 9,10-Sections -  
9.1,9.2,9.3,9.4,9.5,10.1,10.2,10.3,10.4

Unit 3: Chapter 12 -Sections -  
12.1,12.2,12.3,12.4,12.5,12.6

Unit 5: Chapter 14-Sections -  
14.1,14.2,14.3,14.4,14.5,14.6,14.7,14.8,,14.10

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