UNDER-GRADUATE PROGRAMME

IN

MATHEMATICS

Courses of study, Schemes of examinations

& Syllabi (MCBCS)

(Modified Choice Based Credit System)

Applicable to candidates admitted from the
academic year 2015-2016 onwards

PG & RESEARCH DEPARTMENT OF MATHEMATICS
PERIYAR E.V.R. COLLEGE (AUTONOMOUS)
(Nationally Reaccredited at B+ level by NAAC)
TIRUCHIRAPPALLI – 620 023.

(For the candidates admitted from the academic year 2015 onwards)

CORE I : DIFFERENTIAL CALCULUS AND TRIGONOMETRY

Semester: I Subject Code:

Hours: 6 Credits: 5

Objectives: 1. To introduce successive differentiation and partial differentiation

2. To expose trigonometry as a tool in solving problem.

Unit I: Successive differentiation - Proof of Leibnitz Theorem and its applications.

Unit II: Curvature - Cartesian formula for the radius of curvature - Centre of curvature - Evolutes and involutes.

Unit III: Expansions - Expansion of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ - Expansion of $\sin^n\theta$, $\cos^n\theta$ - Expansion of $\cos\theta$, $\sin\theta$ and $\tan\theta$ in terms of θ.

Unit IV: Hyperbolic functions - Relation between the circular and hyperbolic functions - inverse hyperbolic functions.

Unit V: Logarithms of complex quantities – Summation of Trigonometric series - Method of differences - Series of n angles in Arithmetic Progression.

Text Books:

1. S.Narayanan and T.K.Manickavasagam Pillay, "Calculus Volume I", S.Viswanathan (Priters & Publishers) Pvt. Ltd., Reprint 2003 (Units I and II).

2. T.K.Manickavasagam Pillay, S.Narayanan and Ganapathy, Trigonometry, S.Viswanathan (Priters & Publishers) Pvt. Ltd., Reprint 2003 (Units III, IV and V).

Text Book-1	Unit I	:	Chapter 3 : 1.1-1.6, : 2.1-2.2
	Unit II	:	Chapter 10: 2.1-2.5
Text Book-2	Unit III	:	Chapter 3: 1-5 (formation of equations not included)
	Unit IV	:	Chapter 4
	Unit V	:	Chapter 5: 5; Chapter 6: 1 & 2

References:

1. S.Arumugam & others, Trigonometry, New Gamma Publications, 1985 Revised Edition.

2. P.Duraipandian, Laxmi Duraipandian, Jayamala Paramasivam, Trigonometry, Emerald Publishers, Chennai, Reprint 1999.

(For the candidates admitted from the academic year 2015 onwards)

Skill Based Elective - I: MATHEMATICS FOR COMPETITIVE EXAMINATIONS - I

SEMESTER: I | Subject Code:
Hours: 2 | Credits: 4

Objectives:

- To provide a confidence to appear in competitive examinations.
- To solve problems as quick as possible using short cut methods.

UNIT I Numbers - H.C.F. and L.C.M of Numbers – Decimal Fractions.

UNIT II Simplification - Square Root and Cube Root - Percentage.

UNIT III Average – Ratio and Proportion.

UNIT IV Partnership – Profit and Loss – Problems on Numbers. .

UNIT V Time and Work – Time and Distance.

TEXT BOOK: "Objective Arithmetic" by R.S. Aggarwal, S. Chand & Company Ltd., Edition 2006.

UNIT – I	-	Chapters 1, 2, 3	Pages 1-57
UNIT – II	-	Chapters 4, 5, 6	Pages 58 - 123
UNIT – III	-	Chapters 7, 8, 22	Pages 124 – 162; 369 - 383
UNIT –IV	-	Chapters 9, 10, 16	Pages 163 – 205,267-278
UNIT – V	-	Chapters 11, 13	Pages 206 – 222,231-243.

(For the candidates admitted from the academic year 2015 onwards)

Core: II : ALGEBRA AND THEORY OF NUMBERS

Semester: II Subject Code

Hours : 6 Credits: 4

OBJECTIVES:

1. To study the theory of equations and numbers.
2. To study the basic concepts and theorems in algebra.

Unit I : Transformation of equations – Reciprocal roots - reciprocal equation and standard problems.

Unit II : Diminishing and increasing roots of a given equation – Formation of Quotient and Remainder – removal of terms – Formation of equations whose roots are any power of the roots of a given equation .

Unit III: Descartes rule of signs-Horner's method of finding roots of a given equation correct to three decimal places.

Unit IV: Theory of numbers: Prime, composite number – infinite sequence of primes – Decomposition of a composite number – Divisor of N – Euler's function $\phi(N)$ – Integral part of a real number – Highest power of a prime p contained in n!.

Unit V : Divisibility of the product of r consecutive integers by r! – Congruences - Fermat and Wilson's theorem – Lagrange's theorem.

Text Book: 1. "Algebra" Volume – I by T.K. Manickavasagam Pillai, S. Natarajan and Ganapathy, 2006.

Unit I : Chapter 6 Sections 15 and 16

Unit II : Chapter 6 Sections 17 to 20

Unit III : Chapter 6 Section 24 to 30

Text Book: 2. "Algebra" Volume –II by T.K. Manickavasagam Pillai, S. Natarajan and Ganapathy, 2013.

Unit IV : Chapter 5 Sections 1 - 10

Unit V : Chapter 5 Sections 11 – 12 & 16 – 18

(For the candidates admitted from the academic year 2015 onwards)

Core III : ANALYTICAL GEOMETRY OF THREE DIMENSIONS AND INTEGRAL CALCULUS

Semester :II Subject Code:

Hours: 6 Credits :4

Objectives : 1.To study straight lines and spheres.

2. To learn the properties and applications of simple integrals and beta and gamma functions.

UNIT I: Straight line – Symmetrical form of a straight line-Equation of a straight line passing through two given points – The condition for two lines to be parallel- Angle between the plane and the line – Shortest distance between two straight lines.

UNIT II: Sphere – Equation of a sphere –Centre and radius of the sphere-Length of the tangent from the point to the sphere - The plane section of a sphere – Equation of a circle on a sphere –Intersection of two spheres - Equation of the tangent plane to the sphere.

UNIT III: Properties of definite integrals –Integration by parts – Double Integrals – Triple Integrals - Simple problems.

UNIT IV: Reduction formulae – Simple problems.

UNIT V: Beta, Gamma functions – Definition – Recurrence relation – Properties – Relation between Beta and Gamma functions– Simple problems.

Text Book:1. "Analytical Geometry" Part III-Three Dimensions
by T.K.Manickavasagam Pillai &S.Natarajan – Revised Edition 2013.

UNIT I: Chapter III – Sections 1 to 8.

UNIT II: Chapter IV – Sections 1 to 8.

Text Book:2."Calculus" Volume II
by T.K.Manickavasagam Pillai & S.Natarajan – Revised Edition 2013.

UNIT III: Chapter I – Sections 11 & 12, Chapter V-Sections 2.1, 2.2, 4.

UNIT IV: Chapter I – Sections 13.1 to 13.5 & 14.

UNIT V: Chapter VII – Sections 2.1 to 2.5

(For the candidates admitted from the academic year 2015 onwards)

Core – IV: SEQUENCES AND SERIES

Semester: III Subject Code:
Hours: 4 Credit: 4

Aim: To give the students a thorough knowledge of the various aspects of Convergence and Divergence of sequences and series.

UNIT I : Convergence of Sequences – Limit of a sequence –Cauchy's general principal of convergence – Cauchy's first theorem on limits- Bounded sequence Monotonic sequence tends to a finite or infinite limit.

UNIT II : Infinite series – Definition of convergence, divergence and oscillation of series- Necessary condition for convergence – convergence of geometric series – Comparison test, Cauchy's condensation test and simple problems.

UNIT III: D'Alemberts Ratio test, Cauchy's Root test, Raabe's test and simple problems using them – Absolute convergent – Conditionally convergent series- Alternating series and simple problems.

UNIT IV: Binomial theorem for rational index(without proof) – Application of the Binomial theorem to the summation of series – Approximation.

UNIT V: Exponential theorem and Logarithmic theorem (without proof) – summation of series and Approximation.

Text Book: "**ALGEBRA" Volume – I** by T.K.Manicavachagam Pillai, T.Natarajan and K.S. Ganapathy. (S. Viswanathan (Printers & Publishers) Pvt, Ltd., 2013)

UNIT		**Chapter**	**Sections**
I	2	4 to 7	
II	2	8 to 15	
III	2	16.1, 16.2, 17, 19, 21 to 24	
IV	3	5, 10, 14	
V	4	2, 3, 5, 6, 9, 11	

(For the candidates admitted from the academic year 2015 onwards)

Major Elective I: OPERATIONS RESEARCH - I

Semester: III **Subject Code:**

Hours: 4 **Credits :4**

Objectives:

1. To introduce the field of operations research which has many applications in management techniques.
2. To help students to find optimum solution in business and management problems.

Unit I: **Operations Research –An overview:** Introduction – Origin and development of O.R. – Nature and features of O.R. – Applications of Operations Research - **Linear programming problem:** Mathematical formulation - production allocation problem, product mix problem, product allocation problem only- Graphical solution method - General LPP - Canonical and Standard forms only.

Unit II: **Linear programming problem- Simplex Method :** Introduction – The computational procedure –The Simplex Algorithm – Use of Artificial variables -Two Phase method – Big- M method.

Unit III: **Transportation problem**: Definition- Formulation and solution of transportation problem - Initial Basic Feasible solution - Test for optimality - degeneracy in transportation problem - Modi method.

Unit IV: **Assignment problem:** Introduction - Mathematical formulation of the problem – solution methods of Assignment problems - Special cases in Assignment problems: Maximization case only.

Unit V: **Network Scheduling by PERT/ CPM:-** Introduction - Network and basic components - logical sequences - Rules of Network constructions - Concurrent Activities - Critical path Analysis.

Text Book: "Operations Research" by Kanti Swarup, P.K.Gupta and Man Mohan, Sultan Chand & Sons Educational Publishers, New Delhi, 16th Edition 2014.

Unit I : Chapter 1, 2 & 3 Sections 1.1 to 1.3, 1.10, 2.1 to 2.4, 3.2 to 3.5
Unit II : Chapter 4 Sections 4.1, 4.3, 4.4
Unit III : Chapter 10 Sections 10.1, 10.2, 10.5, 10.8, 10.9, 10.10, 10.12, 10.13
Unit IV : Chapter 11 Sections 11.1 to 11.4
Unit V : Chapter 25 Sections 25.1 to 25.6

Reference Books:

1. Hamdy A., Taha, Operations Research, Pearson publisher, 9th Edition,2012

(For the candidates admitted from the academic year 2015 onwards)

Skill Based Elective –II : MATHEMATICS FOR COMPETITIVE EXAMINATION-II

Semester: III Subject Code :
Hours: 2 Credits: 4

Objectives:

1. To provide a confidence to appear in competitive examinations
2. To solve problem in a fraction of minute using short cut methods.

UNIT I: Trains-Boats & Streams-problems on Ages.

UNIT II: Simple interest – Compound interest.

UNIT III: Area-Volume & surface areas.

UNIT IV: Calendar- Clock.

UNIT V: Stock & Shares –Odd man out & Series.

Text Book: "Objective Arithmetic' by R.S. Aggarwal, S.Chand & Company LTD, 2006.

UNIT I: Chapters 14, 15, 17, pages 244-266, 279-285

UNIT II: Chapters 18, 19, pages 289-312

UNIT III: Chapters 20, 21, pages 313-368

UNIT IV: Chapters 25, 26, pages 406-419

UNIT V: Chapters 27, 32, pages 420-431, 486-496

(For the candidates admitted from the academic year 2015 onwards)

Core: V: VECTOR CALCULUS AND FOURIER SERIES

Semester: IV Subject code:
Hours: 6 Credits: 4

Objectives:

1. To introduce vector calculus and study the relation between surface and Volume integrals.
2. To represent periodic functions as Fourier series

Unit I: **Vector differentiation** : Divergence and curl - Vector identities - Applications of Laplacian Operator.

Unit II: **Vector integration:** Tangential line integral, Norma,l surface integral, Volume integral and its applications.

Unit III: Gauss's Divergence theorem (Without proof) - Verification of the Theorem with Problem - Green's theorem (without proof) and its applications.

Unit IV: Stokes theorem (without proof) and verification of the theorem with Problems.

Unit V: **Fourier series**: Fourier series for polynomial functions with period 2π - Half range cosine and sine series.

Text Book: 1. "Vector Analysis" by K.Viswanathan and S.Selvaraj, 1984

Unit I: Chapter 1& Chapter 2 Sections 2.1 to 2.5

Unit II: Chapter 3 Sections 3.1 to 3.6

Unit III: Chapter 4 Sections 4.1 to 4.3

Unit IV: Chapter 4 Section 4.4

Text Book: 2. "Calculus'' (volume III) by T.K.Manickavasagam pillai & S.Narayanan, 2008.

Unit V: Chapter 6 Sections 1 to 5.

(For the candidates admitted from the academic year 2015 onwards)

Core – VI : DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS

SEMESTER: IV SUBJECT CODE:

HOURS: 6 CREDITS: 4

AIM: The students are enabling to

1. **Understand various types of ordinary differential equations.**
2. **Study partial differential equations.**
3. **Know the introduction of Laplace Transform techniques to solve ODE's.**

UNIT I: Second order Linear differential equations with constant coefficients – Particular integrals for e^{ax} ,sinax , cos ax, x^n and e^{ax} f(x) . Linear equations with variable coefficients.

UNIT II: Exact Differential Equations – Variation of parameters – Total differential equations.

UNIT III: Partial differential equations – Formation of P.D.E by elimination of arbitrary constants and arbitrary functions. – Definitions of general particular and complete integrals – solution of first order equations of the form F(p,q) = 0 . F(x,p,q) = 0, F(y,p,q) =0 , F(z,p,q) = 0 ,F (x,p) = F (y,q) and Z =px+qy+f(p,q) - Lagrange's method of solving Pp + Qq = R.

UNIT IV: Laplace Transforms – Results - Periodic functions – Some general theorems – Problems using theorems.

UNIT V: Inverse Laplace Transforms – Results – Problems using results – Applications to solving ordinary differential equations using Laplace transforms technique.

TEXT BOOK : "CALCULUS" - VOLUME III (2013) by S.Narayanan & T.K.Manicavachagam Pillai. (S. Viswanathan Printers &Publishers Pvt Ltd. 2013)

UNIT	CHAPTER	SECTIONS
I	1	3.1 to 3.3 & 4
	2	10
	3	7.1 to 7.4
II	2	1.1, 3, 4, 8.1 to 8.3 & 9
III	4	2.1, 2.2, 3,5.1 to 5.4 & 6
IV	5	1.1, 1.2, 2 3 4 & 5
V	5	6, 7, 8

(For the candidates admitted from the academic year 2015 onwards)

CORE VII -ALGEBRA

Semester: V **Subject Code:**

Hours: 6 **Credits: 5**

Objectives: To enable the students to

1. Know the algebraic structures of Mathematics.
2. Learn about vector spaces and inner product spaces.
3. Develop an analytic thinking in the concept of linear Transformation.

Unit I : Group theory : Definition of a group – Some examples of groups – Some preliminary lemmas - Subgroups - A counting principle

Unit II: Normal subgroups and Quotient groups – Homomorphism – Automorphism – Cayley's theorem – Permutation groups (excluding Cauchy's theorem and Sylow's theorem).

.

Unit III: Ring theory: Definition and example – Simple properties – Special classes of rings – Homomorphism - Ideals and Quotient Rings.

Unit IV: Vector Spaces: Elementary Basic concepts – Linear independence and bases.

Unit V: Inner product spaces and linear transformations: Inner product spaces – The Algebra of linear transformations.

Text Book: " Topics in Algebra" by I.N. Herstein (II edition), PHI Private Ltd. New Delhi 1996.

Unit I : Chapter 2: Sections 2.1 to 2.5.
Unit II : Chapter 3: Sections 2.6 to 2.10
Unit III: Chapter 3: Sections 3.1 to 3.4
Unit IV: Chapter 4: Sections 4.1 to 4.2
Unit V : Chapter 4: Section 4.4 only and Chapter 6 : Section 6.1 only

Reference Book:

1. "Modern Algebra," Arumugam, Isaac, New Gamma Publishing House.

(For the candidates admitted from the academic year 2015 onwards)

Core-VIII : REAL ANALYSIS

Semester: V | Subject Code:
Hours : 6 | Credits: 5

Objectives : To enable the students to

1. Know about the real number system and its properties
2. Study the properties of various functions defined on the real line
3. Get the analytical skill about continuity and derivability.
4. Learn about some standard theorems such Rolle's, Darboux's, Taylor's theorem etc.
5. Get the insight knowledge of Riemann integration and fundamental theorems.

Unit I : Real number system – Field axioms – Order relation in R – Absolute value of a real number and its properties – Supremum and infimum of a set – Order completeness property – Countable and uncountable sets.

Unit II : Continuous functions – Limits of funcitions – Algebra of limits, Continuous functions – Types of discontinuous – Algebra of continuous functions – Boundedness of Continuous functions - Uniform continuity.

Unit III: Differentiability of a function – Derivability and continuity – Algebra of derivatives – Inverse function theorem – Darboux's theorem on derivatives.

Unit IV: Mean Value Theorems - Rolle's Theorem – Mean value theorems on derivatives – Taylor's theorem with remainder –Taylor's series - Power series expansion.

Unit V : Riemann integration – Definition – Darboux's theorem (statement only) – Conditions for Integrability – Intergrability of continuous and monotonic functions – Properties of Integrable functions – Integral functions – Continuity and derivability of integral functions – fundamental theorem of integral calculus and the first mean value theorem.

Text Book: Contents and treatment in

1. **"A first course in Real Analysis" by M.K. Singal and Asha Rani Singal, 29th Edition, 2012, R.Chand & Company Ltd., New Delhi.**

   Unit I : Chapter 1 Sections 2,4,5,6,7,8,9& 10.
   Unit II : Chapter 5 Sections 1.1 to 1.3,1.4 to 1.6(definitions only), 2 to 5, 8
   Unit III : Chapter 6 Sections 1 to 5
   Unit IV : Chapter 7 Sections 1 to 6

2. **" A course of Mathematical Analysis" by Shanthi Narayanan & P.K. Mittal, 2009, S.Chand & Company Ltd., New Delhi.**

   Unit V : Chapter 6 , Sections 6.1, 6.2, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9.1

(For the candidates admitted from the academic year 2015 onwards)

CORE : IX : STATICS

Semester : V | Subject Code:

Hours: 6 | Credits : 4

Objectives: To enable the students to

1. Learn various concepts in Statics and its applications
2. Acquire and develop knowledge in applied mathematics
3. Increase their capability to perform better in UGC, CSIR- NET and SLET Examinations.

Unit I : Introductory ideas on forces – Forces acting at a point.

Unit II : Parallel forces – Moment of a force about a point – Theorem on Moments and Couples – simple problems.

Unit III: Equilibrium of three forces acting on a rigid body – Coplanar forces.

Unit IV: Friction – Laws of friction – Equilibrium of a particle on a rough inclined plane and under any forces – Problems on friction.

Unit V : Equilibrium of Strings and Chains under gravity – Common Catenary – problems on suspension bridges.

Text Book: "STATICS" by Dr.M.K.Venkatraman, Sixteenth Edition, 2013, Agasthiar Publications,

Unit I : Chapter 1 Sections 1 to 6; Chapter 2 Sections 1 to 16.
Unit II : Chapter 3 Sections 1 to 13 and Chapter 4 Sections 1 to 10.
Unit III : Chapter 5 Sections 1 to 6; Chapter 6 Sections 1 to 13,upto Page 178.
Unit IV : Chapter 7 Sections 1 to 13.
Unit V : Chapter 11 Sections 1 to 8.

Reference Books:

1. "Statics" by K.ViswanathaNaik and M.S.Kasi
2. "Statics" by M.L.Khanna
3. "Statics" by Duraipandian

(For the candidates admitted from the academic year 2015 onwards)

Core X: C PROGRAMMING

Semester :V | Subject Code:
Hours: 4 | Credits :4

Objectives:

1. To introduce the concepts of C language to the students.
2. To enable the students to write programmes for mathematical applications.

UNIT I: Character set – C tokens – Keywords and identifiers – Constants-Variables- Data types- Declaration of variables and storage class- Assigning values to variables – Operators and Expressions – Managing input and output operations – Reading a character – Writing a character –Formatted input – Formatted output.

UNIT II: Decision making and branching –Decision making with IF statement – simple IF statement - The IF ELSE statement – Nesting IF...ELSE statements – the ELSE IF ladder - The switch statement - The ?: operator – The GOTO statement – Decision making and looping – The WHILE, DO,FOR statements.

UNIT III: Character arrays and strings – Declaring and initializing string variables – Reading strings from terminal – Writing strings to screen – Arithmetic operations on characters- Putting strings together – Comparision of two strings – String handling functions – Arrays – One dimensional, two dimensional and multi dimensional arrays – Pointers – Understanding pointers - Accessing the address of a variable through its pointer – Declaring and initializing pointer variables - Chain of pointers.

UNIT IV: User defined functions – Need for user defined functions – A multi-function program – Elements of user defined functions – Definitions of functions – Return values and their types-Function calls –Function declaration – Category of functions – No arguments and no return values –Arguments but no return values- No arguments but returns a value – Functions that return multiple values – Nesting of functions – Recursion.

UNIT V: File Management in C – Defining and opening a file – Closing a file – Input / Output operations on files – Error handling during I/O operations - Random access to files.

Text Book: "Programming in ANSI C" (Fifth edition) by E.Balagurusamy,Tata McGraw Hill Publishing Company Limited, 2010.

UNIT I: Chapter 2 – Sections 2 to 10, Chapter 3 – Sections 2 to 12,

Chapter 4 – Sections 2 to 5.

UNIT II: Chapter 5 – Sections 2 to 9, Chapter 6 – Sections 2 to 4.

UNIT III: Chapter 7 – Sections 2 to 7, Chapter 8 – Sections 2 to 8.

Chapter 11 – Sections 1 to 7.

UNIT IV: Chapter 9 – Sections 2 to 16.

UNIT V: Chapter 12 – Sections 2 to 6.

(For the candidates admitted from the academic year 2015 onwards)

Major Elective II: OPERATIONS RESEARCH - II

Semester: V | Subject Code:

Hours: 5 | Credits : 5

Objectives:

1. To introduce the various techniques of Operations Research.
2. To make students solve real time problems in Business and management.

UNIT – I : **Sequencing Problem:** Introduction –Problem of sequencing – Basic terms used in sequencing –Processing n jobs through two machines –Processing n jobs through k machines.

UNIT – II : **Games and Strategies :** Two person zero sum games - Some basic terms - the maximin - minimax principle - Games without saddle points - Mixed strategies - graphic solution of 2 x n and m x 2 games – Dominance property .

UNIT- III : **Replacement Problems :** Introduction – Replacement policy when value of money does not change with time – Replacement policy when value of money changes with time – Replacement of equipment that fails suddenly - Group replacement policy .

UNIT IV : **Inventory Control :** Costs associated with inventories – Factors affecting inventory control - An inventory control problem – The concept of EOQ – Deterministic inventory with no shortages – Deterministic inventory problem with shortages – problems of EOQ with price breaks.

UNIT V : Queueing Theory – Elements of a queueing system – Classification of queueing models – Definition of transient and steady states – Poisson Queueing Systems – Model I { (M/M/1):(∞/FIFO)} – Model III {(M/M/1) : (N/FIFO)} – Model V {(M/M/C):(∞/$FIFO$)}.

Text Books:

1. Kanti Swarup, P.K. Gupta and Man Mohan, Operations Research, 16th edition, Sultan Chand and Sons, Reprint 2014.

Unit I	:	Chapter 12- sec 12.1 to 12.5 pp.327 – 338
Unit II	:	Chapter 17- sec 17.1 to 17.7 pp.443 – 464
Unit III	:	Chapter 18 – sec 18:1, 18:2.1,18:2.2,18:3 pp.478 – 492
Unit IV	:	Chapter 19 – sec 19.6 to 19.12 pp. 510 – 538
Unit V	:	Chapter 21 – sec 21:3, 21:7, 21:8, 21:9, pp.589,590,596 to 604, 608 to 610, 613to 618.

(For the candidates admitted from the academic year 2015 onwards)

Core XI: COMPLEX ANALYSIS

SEMESTER: VI | Subject Code:
Hours: 6 | Credits: 5

Objectives: To enable the students to

1. Analyze Analytic and Harmonic Functions.
2. Understand Bilinear Transformations.
3. Know the Complex Integration.

UNIT I **Analytic Functions:** Functions of a Complex Variable – Limits – Continuous Functions – Differentiability – The Cauchy-Riemann Equations – Analytic Functions – Harmonic Functions.

UNIT II **Bilinear Transformations:** Bilinear Transformations – Cross Ratio – Fixed Points of Bilinear Transformations – Some Special Bilinear Transformations.

UNIT III **Complex Integration:** Cauchy's Theorem – Cauchy's Integral Formula – Higher Derivatives.

UNIT IV **Series Expansions:** Taylor's Series – Laurent's Series – Zeroes of an Analytic Functions – Singularities.

UNIT V **Calculus of Residues:** Residues – Cauchy's Residue Theorem – Evaluation of Definite Integrals.

TEXT BOOK: "Complex Analysis" by Dr. S. Arumugam, A. Thangapandi Isaac, & A. Somasundaram, Scitech Publications (India) Pvt. Ltd, New Delhi, Edition 2002.

UNIT – I - Chapter 2 Sections 2.1 to 2.2 and 2.4 to 2.8

UNIT – II - Chapter 3 Sections 3.2 to 3.5

UNIT – III - Chapter 6 Sections 6.2 to 6.4

UNIT –IV - Chapter 7 Sections 7.1 to 7.4

UNIT – V - Chapter 8 Sections 8.1 to 8.3

(For the candidates admitted from the academic year 2015 onwards)

Core XII: GRAPH THEORY

Semester :VI | Subject Code:
Hours: 6 | Credits : 4

Objectives:

- To understand various types and properties of graph.
- To realize the physical situation in which graph theory can be applied.

Unit I: **Graphs and sub graphs:** Graph – Application of graphs – Finite and Infinite graphs – Incidence and degree - Isolated Vertex, Pendant Vertex and Null graphs – Isomorphism – Subgraphs – Walks, Paths and Circuits – Connected graphs.

Unit II: **Euler and Hamiltonian graphs**: Euler graph – Operations of graphs – More on Euler graphs- Hamiltonian path and circuits – The traveling salesman problem.

Unit III: **Trees:** Trees – Some properties of trees – Pendant vertices in a tree – Distance and centre in a tree – Rooted and binary trees – Spanning trees – Fundamental circuits.

Unit IV: **Cut-sets and cut-vertices:** Cut-set – Some properties of cut-set – All cut-sets in a graph – Fundamental circuits and cut-sets – Connectivity and separability.

Unit V: **Planar and Dual planar graphs:** Planar graphs – Kuratowski's two graphs – Chromatic number – Chromatic partitioning – Chromatic polynomial.

Text Books:

1. '**Graph Theory with applications to engineering and computer science**' **by Narsingh Deo**, Prentice Hall of India Private Limited, 2003.

   Unit I **:** Sections 1.1 to 1.5, 2.1, 2.2, 2.4, 2.5
   Unit II **:** Sections 2.6 to 2.10
   Unit III **:** Sections 3.1 to 3.5, 3.7, 3.8
   Unit IV **:** Sections 4.1 to 4.6
   Unit V **:** Sections 5.2, 5.3, 8.1 to 8.3

Reference Books:

1. **'Introduction to graph theory'**by Arumugam. S. and Somasundaram. S.,
2. **'Graph theory'** by Harrary. F.,Narosa Publishing house, 1988.

(For the candidates admitted from the academic year 2015 onwards)

Core XIII: DYNAMICS

Semester: VI Subject Code:

Hours: 5 Credits: 4

Objectives: To enable the students to

1. Learn various concepts in dynamics and its applications.
2. Acquire and develop knowledge in applied mathematics.
3. Increase their capability to perform better in UGC, CSIR and SLET Examinations.

UNIT I: Kinematics : Velocity and Acceleration – Angular Velocity - Motion of a particle in a Straight line under uniform acceleration - Vertical and downward Motion under gravity.

UNIT II: Projectiles: Projections in vacuum - Maximum height reached, Range , Time of Flight – Range on an inclined plane.

UNIT III: Collision of Elastic Bodies: Conservation of linear momentum - Direct and oblique collisions of Two smooth Spheres - Kinetic energy and impulse.

UNIT IV: Simple Harmonic Motion: Simple harmonic motion in a straight Line - Simple Pendulum – Load Suspended by an elastic body.

UNIT V: Motion under Action of Central Forces: Velocity &acceleration in polar-co-ordinates – Central forces - Differential equation to a central orbit in polar and pedal co-ordinates - Given the orbit to find the law of force - Given the law of force to find the orbit.

Text Book: **"DYNAMICS**" by **Dr.M. K. Venkatraman**, 16TH Edition, 2014, Agasthiar Publications.

Unit I: Chapter 3 Sections 3.1 to 3.6, 3.11 to 3.13, 3.16 to 3.18, 3.22 and 3.29 to 3.31
Unit II: Chapter 6 sections 6.1 to 6.5, 6.7 to 6.10 & 6.12
Unit III: Chapter 8 sections 8.1 to 8.8
Unit IV: Chapter 10 sections 10.1 to 10.4, 10.6, 10.7, 10.9 and 10.12 to 10.15
Unit V: Chapter 11 sections 11.2, 11.6 to 11.13

Reference Books: 1.Dynamics" by K.Viswanatha naik and M.S.Kasi.
2. Dynamics" by Narayanan.
3. Dynamics by Duraipandian.

(For the candidates admitted from academic year 2015 onwards)

CORE XIV: ASTRONOMY

SEMESTER: VI SUB CODE:
HOURS: 5 CREDITS: 4

Objective:

1. Astronomy is the science dealing with the study of heavenly bodies (Astronomical objects)
2. To study the characteristics of Moon, Stars and Eclipses.

Unit I : Spherical Trigonometry-relevant formula for spherical trigonometry (without proof) – Celestial Sphere – Diurnal motion.

Unit II : Dip of Horizon – Twilight – Astronomical refraction – Tangent and Cassini's formula for refraction.

Unit III : Kepler's laws of planetary motion (statement only) –Newton's deductions from them –Three anomalies of the earth and relations between them.

Unit IV : Time – Equation of time – Seasons.

Unit V : Moon – Eclipses.

Text Book : "Astronomy" by Prof . Kumaravelu and Prof. Sushseela Kumaravelu .(Revised and enlarged edition 2013). (without Problems)

UNIT	CHAPTER	SECTION
I	I & II	1-13 , 21-23 , 25 (without proof) & 39 -63 , 66-68 , 69 – 79 , 80 – 83.
II	III & IV	106 -116 & 117 – 133.
III	VI	146 , 153 (statement only) & 156 – 163.
IV	VII	166 – 170 , 172 , 173.
V	XII XIII	229 -241 & 256 – 263 , 267 – 270.

(For the candidates admitted from the academic year 2015 onwards)

MAJOR ELECTIVE III : NUMERICAL METHODS

Semester : VI Subject Code:
Hours: 5 Credits : 4

Objectives:

1. To introduce different numerical techniques to solve Algebraic and differential equations
2. To develop skills in solving problems using numerical techniques.

Unit I : The solution of algebraic and transcendental equations –The Bisection method – The Method of False position – The Iteration method – Newton-Raphson method.

Unit II : Finite differences – Forward differences, backward differences – Newton's Formula for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula.

Unit III: Numerical differentiation – Numerical Integration – Trapezoidal rule – Simpson's one third rule – Simpson's 3/8 rule

Unit IV: Numerical solution of Ordinary Differential Equations – solution by Taylor's series – Picard's method of successive approximations.

Unit V: Euler method – Modified Euler method – Runge-kutta method – Milne's Predictor-Corrector method.

Text Book: **"Introductory Methods of Numerical Analysis" by S.S.Sastry,** Prentice Hall of India private limited, New Delhi 4th edition, 2005.

Unit I : Chapter 2 Sections 2.1 to 2.5
Unit II: Chapter 3 Sections 3.1, 3.3.1, 3.3.2, 3.6, 3.9, 3.9.1
Unit III : Chapter 5 Sections 5.2, 5, 4, 5.4.1, 5.4.2, 5.4.3
Unit IV : Chapter 7 Sections 7.1 to 7.3
Unit V: Chapter7 Sections 7.4, 7.4.2, 7.5,7.6.1

Reference Books:

"Numerical Methods" by P.Kandasamy & K.Thilagavathy

(For the candidates admitted from the academic year 2015 onwards)

Skill Based Elective III: MATHEMATICS FOR ECONOMICS

Semester :VI Subject Code:
Hours: 2 Credits :4

Aim:

1. To study various applications of differentiation and integration in economics.
2. To bring certain situations into economic models.

UNIT I: Application of differentiation in Economic theory: Elasticity of demand- Utility function – Production function – Cost function –Illustrative examples.

UNIT II: Revenue : Revenue function – Marginal Revenue product , Marginal Physical Product and Marginal Revenue - Illustrative examples.

UNIT III: Application of partial derivatives in economics : Theory of consumer behaviour - producer's equilibrium, nature of commodities and partial derivatives - Illustrative examples.

UNIT IV: Application of integration in economics : Consumer's surplus – Producer's surplus – A problem on durable capital goods - Illustrative examples.

UNIT V: Economic models : Model construction – Economic and Econometric models- Classical model- National income model.

Text Book: "Mathematics for Economics" by D.R.Aggarwal,Vrinda Publications (P) Ltd.,2006.

UNIT I: Chapter 11 – Pages 254 - 261, 266 – 273

UNIT II: Chapter 11 – Pages 262 - 265, 274 - 284

UNIT III: Chapter 14 – Pages 363 – 385.

UNIT IV: Chapter 15 – Pages 437 – 459.

UNIT V: Chapter 17 – Pages 537 – 543.

(For the candidates admitted from the academic year 2015 onwards)

Allied I : Mathematics Paper I
(For Physics and Chemistry Major)

Semester : I **Subject Code :**
Hours : 4 **Credits : 4**

Objectives:

- To introduced higher derivatives and to learn Leibnitz theorem and its applications.
- To learn about vector differentiation, vector integration and applications.

Unit I: Higher derivatives – nth derivatives of standard functions – Leibnitz Theorem (Statement only) for nth derivative of a product of two functions – Simple Problems.

Unit II: Curvature and Radius of Curvature in Cartesian Co-ordinates only.

Unit III: Properties of definite integrals – Integration by parts.

Unit IV: Vector differentiation – vector differential operator DEL, Gradient, Divergence and Curl – Formulae involving DEL once – simple problems.

Unit V: Vector Integration – Line, Surface and Volume Integrals – simple problems.Gauss Divergence, Stokes, Greens theorem (statements only).

Text Books:

1. **"Calculus" Vol I by** T.K.Manickavasagam Pillai, and S.Narayanan **, 2004, S.Viswanathan Pvt. Ltd., (Unit I, Unit II).**

2. **"Calculus" –Vol II by** T.K.Manickavasagam Pillai, and S.Narayanan **, 2013, S.Viswanathan Pvt. Ltd., (Unit III).**

3. **"Vector Algebra and Analysis" by** Viswanathan and Selvaraj, 1984 **(Unit IV and Unit V)**

Unit I: Chapter 3 – Sections 1.1, 1.2, 1.3, 1.4, 1.6, 2.1
Unit II: Chapter 10 – Sections 2.3

Unit III: Chapter 4 – Sections 1, 2,6,7,8,9,11

Unit IV: Chapter 6 – Sections 1,2,3,4, 5.

Unit V: Chapter 1 – Sections 1.1 to 1.5 and Chapter 2 – Sections 2.1 to 2.2, 2.4 to 2.7

(For the candidates admitted from the academic year 2015 onwards)

Allied I : MATHEMATICS PAPER II

(For Physics and Chemistry Major)

Semester: II — Subject Code :
Hours : 4 — Credits : 3

Objectives: To provide basic knowledge of series, matrices and numerical methods.

UNIT I : Partial Fractions - Binomial Series - Summation of series - Finding terms - Coefficient of x^n (excluding Approximations & Limits).

UNIT II: Exponential Series - Summation - Logarithmic Series - Summation.

UNIT III: Matrices – Rank of a matrix - Solving simultaneous linear equation in three unknowns using Elementary operations method - Eigen values and Eigen vectors - Verification of Cayley Hamilton theorem.

UNIT IV :Finite differences : Interpolation – Newton's (Forward and Backward) Interpolation formula, Lagrange's interpolation formula (problems only).

UNIT V : Expansions of cos $n\theta$ and sin $n\theta$ - Powers of sines and cosines of in terms of functions of multiples of θ.

Text Books:

1. Ancillary Mathematics, Volume -I, 2009 Edition, S. Narayanan, R. Hanumantha Rao, T.K..Manicavachagom Pillay, P.Kandaswamy.

Unit I :	Chapter 1- sec 1.1 - 1.2, pages 1-19.
Unit II :	Chapter 1 - sec 1.3,1.4, pages 28-48.
Unit III:	Chapter 3 - sec 3.2 - 3.4, pages 137 - 160.
Unit IV :	Chapter 4 – sec 4.1 and 4.3, pages 183 – 201 and 208 – 213.
Unit V :	Chapter 5 - sec 5.1 - 5.2, pages 220-232.

(For the candidates admitted from the academic year 2015 onwards)

Allied I: Mathematical Paper III

(for Physics and chemistry Majors)

Semester: II **Subject Code:**

Hours: 4 **Credits: 3**

Objectives:

1. To expose differential equations as a powerful tool in solving problems
2. To introduce Laplace transform techniques to solve ODE's.
3. To understand the various statistical methods by giving real life examples.

Unit I: Second order differential equations with constant coefficients – Particular integrals for e^{ax}, $\sin ax$, $\cos ax$, x^n.

Unit II: Partial differential equations – Formation of Partial differential equations by elimination of arbitrary constants and arbitrary functions- Definition of general, particular and complete integrals - Solutions of first order equations of the form F(p, q) = 0, F(x, p, q) = 0, F(y, p, q) = 0, F(z, p, q) = 0, F(x,p)= F(y, q) and z = px + qy + f(p, q).

Unit III: Laplace Transforms – Definitions and theorems – Some simple problems

Unit IV: Inverse Laplace transforms - Some simple problems – Solving ordinary differential equations using Laplace Transforms.

Unit V: Correlation and regression - Simple correlation - Simple Linear regression (simple problems only)

Text Book: 1. "Calculus, Vol. III " by S. Narayanan , T.K. Manickavasagam Pillai, 2008.

Unit I: Chapter 2: Sections 1 2, 3,4a,4b,4c. (pages 49 – 71)

Unit II: Chapter 4: Sections 2.1, 2.2, 3, 5.1 to 5.4.(pages 115-121, 127-134)

Unit III: Chapter 5: Sections 1,2,4 (pages 154-161, 165-170)

Unit IV: Chapter 5: Sections 6,7,8. (pages 174-188)

Text Book: 2. "Business Mathematics and Statistics" by P.Navaneetham, Gemini Publishing House.

Unit V: Part II- Chapters 12 and 13.

Reference Books.

1. "Differential equations and its applications" by S. Narayanan , T.K. Manickavasagam Pillai

2. "Statistical methods" by S.P.Gupta, Sulthan Chand & Sons.

(For the candidates from the academic year 2015 onwards)

ALLIED I: MATHEMATICS PAPER – I

(B.Sc. Computer Science Major)

Semester: I Subject code:

Hours: 4 Credits: 4

Objectives:

1. To introduce the field of operations research which has many applications in management techniques.
2. To help students to find optimum solution in business and management problems.

UNIT I: Linear Programming Problem – Mathematical Formulation – Graphical solution – General Linear Programming problem .

UNIT II: Transportation problem – Initial Basic Feasible Solution – North-West corner Rule – Matrix Minima method – Vogel's approximation method – Unbalanced transportation problem.

UNIT III: Assignment problem – Hungarian assignment Method – Unbalanced Problems.

UNIT IV: CPM – Network – Critical Path Method

UNIT V: PERT – PERT Calculations – t_0, t_m, t_p, t_e, σ

Text Book: "**Operations Research" by Kantiswarup, Gupta and Manmohan, 12th Edition, 2004.**

Unit I : Chapter II Sections 2.1, 2.2. Chapter III 3.2, to 3.5.

Unit II: Chapter X Sections 10.1, 10.2 (General form only) 10.3 &`10.7 to 10.9,10.14

Unit III: Chapter XI Sections 11.1, 11.2 (General form only) 11.3 & 11.4 (Maximization case only)

Unit IV: Chapter XXI Sections 21.1, 21.2, 21.4, 21.5

Unit V: Chapter XXI Sections 21.6 & 21.7

Reference Book: "Operations Research" by Hamdy A Taha

(For the candidates admitted from the academic year 2015 onwards)

ALLIED I : MATHEMATICS PAPER – II

(B.Sc. Computer Science Major)

Semester :II Subject Code:

Hours: 4 Credits :3

Objectives:

1. To expose differential equations as a powerful tool in solving problems.
2. Introduction of Laplace transforms techniques to solve ODE's
3. To understand the various statistical methods by giving real life examples.

Unit I : Ordinary differential equations of first order but of higher degree – Equations Solvable for x,y and dy/dx, Clairaut's form.

Unit II : Second order linear differential equations with constant coefficients – particular integrals for e^{ax}, sin ax, cos ax, x^n and $e^{ax}f(x)$

Unit III: Laplace transforms – Laplace transforms for e^{at}, sinat, cosat, t^n, Laplace transform of f'(t) and f''(t)

Unit IV: Inverse Laplace transforms related to the standard forms – Application of Laplace transform for solving ordinary differential equations with constant coefficients.

Unit V: Correlation and Regression: Karl Pearson's Co-efficient of correlation – Spearman's Rank correlation –Regression.

Text Book: 1 "Calculus" Volume III by S.Narayanan, T.K.ManickavasagamPillai, S.Viswanathan pvt.Ltd, 2008.

Unit I: Chapter 1: Sections 5.1, 5.2, 5.3, 5.4, 6.1 (Problems only)

Unit II: Chapter 2: Sections 1, 2, 3, 4 (Problems only)

Unit III: Chapter 5: Sections 1, 2, 4

Unit IV: Chapter 5 Sections 6, 7, 8

Text Book: 2 "Fundamentals of Mathematical Statistics" by S.C.Gupta&V.K.Kapoor, Sultan Chand & Sons, New Delhi, Edition 2002.

Unit V : Chapter 10 : Sections 10.1,10.2,10.3, 10.4, 10.7,10.7.1,10.7.2,10.7.3(Simple problems only).

Chapter 11 : Sections 11.1,11.2,11.2.1,11.2.2 (Simple problems only).

Reference Book: "Ancillary Mathematics - Volume II" by S.Narayanan, T.K.Manickavasagam Pillai

(For the candidates admitted from the academic year 2015 onwards)

ALLIED I: MATHEMATICS PAPER - III

(**B.Sc. Computer Science Major)**

Semester: II Subject Code:

Hours: 4 Credits: 3

Objectives:

1. To study the techniques to find the sum of different series
2. To study the characteristic roots and vectors of the matrix.
3. To know the concept of theory of equations.

UNIT I: Statement of Binomial theorem - Exponential and Logarithmic theorems (no proof) - summations related to Binomial, Exponential and Logarithmic series.

UNIT II: Types of matrices – Sum of matrices - Product of matrices - Various kinds of matrices - Rank of a Matrix.

UNITIII: Definition of characteristic equation, Eigen values & Eigen vectors - Evaluation of Eigen Values –Statement of Cayley –Hamilton theorem-Verification of Cayley-Hamilton theorem - Finding inverse of a matrix using Cayley-Hamilton theorem.

UNIT IV: Transformation of equations - diminishing, increasing and multiplying the roots.

UNIT V: Reciprocal equations - Descartes' rule of signs.

Text Books:

1. "Algebra" Volume I (2006) by T.K.Manickavasagam pillai, Natarajan and Ganapathy.

2. "Matrices" by M.L.Kanna, Edition 1982, (Unit II, Unit III)

Unit I: Chapter 3 –Section 1, Chapter 4-Section 2,3,5.(Book 1)

Unit II: Chapter 1to4 & Chapter 7 Section 29.(Book 2)

Unit III: Chapter 9-Section 39, 40, 41. (Problems only) (Book 2)

Unit IV: Chapter 6; 15.2,17 (Book 1)

Unit V: Chapter 6; 16, 24 (Book 1)

Reference Book: "Ancillary Mathematics" Volume I by S.Narayanan, T.K.Manickavasagam Pillai and R. Hanumantha Rao

(For the candidates admitted from academic year 2015 onwards)

Allied I : Mathematics Paper I

(For Statistics Major)

Semester I — Subject Code :

Hours : 4 — Credits : 4

Objectives :

1. To introduce several techniques of differentiation and integration of real valued function.
2. To learn the applications of Beta and Gamma functions.

UNIT I : Successive Differentiations - n^{th} derivative of standard functions.

UNIT II: Formations of equations involving derivatives – Leibnitz theorem (no proof) and its applications.

UNIT III: Formulae for integrals –Definite integrals – Integration by parts .

UNIT IV: Properties of definite integrals.

UNIT V: Beta and Gamma functions – Definitions – Recurrence formula of Gamma function –Properties of Beta function – Relation between Beta and Gamma function and Simple problems.

Text Books :

1. " CALCULUS" Volume I by T.K. Manicavachagom pillay & S. Narayanan.
2. "CALCULUS" Volume II by T.K.Manicavachagom pillay & S. Narayanan. S.Viswanathan Pvt.Ltd., Reprint 2013.

BOOK	UNIT	CHAPTER	SECTION
1	I	III	1.1 to 1.4
1	II	III	1.6 and 2.1
2	III	I	1 to 4, 12
2	IV	I	11
2	V	VII	2.1, 2.3, 3 & 4

(For the candidates admitted from the academic year 2015 onwards)

Allied I: Mathematics Paper II

(For Statistics Major)

Semester: II Subject code:

Hours: 4 Credits: 3

Objectives:

1. To expose differential equations as a powerful tool in solving problems.
2. To introduce different numerical techniques to solve Algebraic equations.
3. To solve problems as quick as possible using short cut methods.

UNIT I : Second order differential equations with constant coefficients – Particular integrals for e^{ax}, sinax, cosax, x^m .

UNIT II: Partial differential equations – Formation of equations by eliminating arbitrary constants and arbitrary functions. Solving partial differential equations (first order only)

UNIT III: Numbers – H.C.F. & L.C.M. of Numbers.

UNIT IV: Decimal fractions - Simplification .

UNIT V: Square root and cube root – Percentage.

Text book:1 "Calculus" Volume III by T.K.Manicavachagom pillay & S.Narayanan, 2008.

Unit I : Chapter I Sections 1 ,2,3 and 4a,4b,4c

Unit II : Chapter IV Sections 1,2,3 and 5.1 to 5.4

Text Book: 2 Content and treatment as in "Objective Arithmetic" by R.S.Aggarwal, S.Chand &Company LTD, 2006.

Unit III : Chapters 1,2

Unit IV: Chapters 3,4

Unit V : Chapters 5,6 .

(For the candidates admitted from the academic year 2015 onwards)

Allied I: Mathematics Paper III

(For Statistics Major)

Semester: I Subject code:

Hours: 4 Credits: 3

Objectives:

1. To study the characteristic roots of the matrix and Cayley Hamilton theorem.
2. To introduce several techniques for transforming equations.

UNIT I : Matrices – Types of matrices – some simple problems – Characteristics equation – Eigen values.

UNIT II: Statement of Cayley Hamilton Theorem – Application of Cayley Hamilton theorem – Rank of the matrix – Finding the ranks of 2x2, 3x3 matrices using determinants.

UNIT III: Form an equation with given roots – imaginary roots occur in pairs –irrational roots occurs in pairs – Relation between roots and coefficients.

UNIT IV: Transformations of equations- Roots with sign changed – Roots multiplied by a number – increase or decrease the roots .

UNIT V: Reciprocal equations – Descarte's rule of signs .

Text books:

1. "Algebra" volume I by T.K.Manicavachagom pillay, T. Natarajan , K.S. Ganapathy.
2. "Algebra" volume II by T.K.Manicavachagom pillay, T. Natarajan, K.S. Ganapathy.

Unit I : Chapter II Sections 1 to 7& 16 (Characteristic equations and Eigen values only) in Book 2.
Unit II : Chapter II Sections 11, 16.3 & 16.4 in Book 2.
Unit III: Chapter VI Sections 9, 10 & 11 (problems only) in Book 1.
Unit IV: Chapter VI Sections 15.1, 15.2, 17, &18 (problems only) in Book 1.
Unit V : Chapter VI Sections 16.1, 16.2 & 24 in Book 1.

(For the candidates admitted from the academic year 2015 onwards)

Non-Major Elective - I: OPTIMIZATION TECHNIQUES – I

(II B.Com. Sec A & B)

SEMESTER: IV | Subject Code:
Hours: 2 | Credits: 4

Objectives:

- To introduce the various techniques of research.
- To make the students to solve the real-life problems in business and management.

UNIT I **Linear Programming Problem :** Graphical Solution Method.

UNIT II **The Transportation Model :** Finding an Initial Basic Feasible Solution using North-west Corner Rule, Matrix Minima Method (Least Cost Method) and Vogel's Approximation Method.

UNIT III **The Assignment Model :** Balanced assignment problems only.

UNIT IV **Sequencing Models :** n jobs processing through two machines only.

UNIT V **Replacement Models :** Replacement of items whose maintenance and repair costs increase with Time, Ignoring Changes in the Value of Money during the Period.

Text Book: "Problems in Operations Research (Principles and Solutions)" by Er. Prem Kumar Gupta & Dr.D. S. Hira, S. Chand & Company Pvt. Limited, New Delhi, Edition 2009.

UNIT – I	-	Chapter 2 Section 2.3 (simple problems only)
UNIT – II	-	Chapter 3 Sections 3.2 to 3.4 (simple problems only)
UNIT – III	-	Chapter 4 Sections 4.1 to 4.5 (simple problems only)
UNIT –IV	-	Chapter 5 Sections 5.1 to 5.4 (simple problems only)
UNIT – V	-	Chapter 11 Section 11.2 (simple problems only)

(For the candidates admitted from the academic year 2015 onwards)

Non-Major Elective: II OPTIMIZATION TECHNIQUES – II

(III B.Com. Sec. A & B)

Semester: V I Subject Code

Hours: 2 Credits: 2

Objectives:

1. To Introduce the various techniques of research.
2. To make students solve real life problems in business and management

Unit I: **Sequencing Problems:** n jobs and three machines only

Unit II: **Theory of Games** : Characteristics of games - definitions - Pure strategy - two person zero - Sum game with saddle point – Reduce the game to 2xn or mx2 by Dominanace and solve by Graphical method - two person zero - sum game without saddle point

Unit III: **Inventory Problem:** Inventory Model with Deterministic Demand – classical EOQ model (with no shortage)

Unit IV: **Project scheduling by CPM** : Network – Critical Path Method

Unit V: **Project scheduling by PERT:** PERT calculations t_o, t_m, t_p, t_e, σ

Text Book: Problems in Operations research (Principles and solutions) by Er. Premkumar Gupta & Dr. DS Hira, S. Chand & Company limited New Delhi, Edition 2009.

Unit I	:	Chapter 5 Section 5.5 (Simple Problem only)
Unit II	:	Chapter 8.4 Section 8.4 -1 to 8.4-4, 8.4-7.3 (Simple Problem only)
Unit III	:	Chapter 12 Section 12.1 to 12.5-1 (Simple Problem only)
Unit IV	:	Chapter 14 Section 14.1 to 14.8 (Simple Problem only)
Unit V	:	Chapter 14 Section 14.9 (Simple Problem only)

Reference Book :

"Problems in Operations Research (Methods and Solutions)" by PK. Gupta & Man Mohan, Sultan chand & Sons New Delhi.