Employability Courses

B.Sc Mathematics

Semester III

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core V Vector Calculus and Fourier Series	**Course Code: 317M05**
Semester: III	**No. of Credits: 3**
No. of hours :45 (Total hours)	**C:T: 39: 6**
CIA Max. Marks: 25	**ESE Max. Marks: 50**

(C: Contact hours, T: Tutorial)

Course Objectives:

The objectives of this course are

- to introduce various operations involving vectors.
- To familiarize the line, surface and volume integrals.
- to introduce the Fourier series and its various forms.

Course Outcomes: On completion of the Course the student will be able to

CO	**Statement**	**Bloom's Taxonomy level**
CO1	know about the concepts of Gradient, Divergence and Curl.	**R**
CO2	relate the identities involving the operators.	**R**
CO3	evaluate Line integrals and surface integrals using Gauss divergence theorem.	**A**
CO4	evaluate surface and volume integrals using Stoke's and Green's theorem.	**A**
CO5	obtain Fourier series for various functions.	**U**
CO6	convert any mathematical function to trigonometric function.	**U**

Remembrance U –Understanding A-Apply

Syllabus:

Unit I	**8 hrs**
Gradient: Scalar and Vector point functions – Level Surfaces – Directional derivative of a scalar point function – Gradient of a scalar point function–Gradient of sum and product of functions – Gradient of f(r). Book 1: Chapter 2: Sections 2.1 - 2.6	

Unit II	**8 hrs**
Divergence & curl: Divergence and curl of a vector point function – Solenoidal and rotational vectors – Theorems on divergence and curl – Laplacian operator – Divergence and curl of a gradient – Divergence and curl of a curl – Divergence and curl of f(r)$\bar{r}$ – Scalar	

potential.
Book 1: Chapter 3: Sections 3.1 - 3.5

Unit III **8 hrs**

Integral Theorems: Integral Theorems – Green's theorem in the plane – Gauss divergence theorem – Stoke's theorem.
Book 1: Chapter 6: Sections 6.1 - 6.4

Unit IV **7 hrs**

Fourier series: Fourier series **–** Even and odd functions.
Book 2: Chapter 1: Pages 96 – 135

Unit V **8 hrs**

Fourier series: Half - range series – Half - range sine series – Half - range cosine series, Change of interval.
Book 2: Chapter 1: Pages 135 - 154

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-III	Vector Analysis	P.Duraipandian, Kayalal Pachaiyappa	Muhil Publishers, Revised Edition 2009
IV,V	Mathematics for B.Sc.. Branch–I, Volume – IV	P.Kandasamy, K.Thilagavathi	S.Chand & Company Limited, First Edition 2005

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Vector Analysis	Dipak Chatterjee	PHI Learning Private Limited, Second Edition, 2009
2	Calculus(Major) Volume III	S.Narayanan and T.K. Manicavachagom Pillay	S.Viswanathan (printers and publishers) Pvt., Ltd., 2012.

B.Sc Mathematics

Semester III

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core VI Statics	**Course Code: 317M06**
Semester: II	**No. of Credits: 4**
No. of hours :60 (Total hours)	**C:T: 52: 8**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

Objectives of this course are

- to provide a strong foundation in understanding the concepts of mechanics.
- to know about equilibrium of a particle.
- to impart knowledge about the forces acting on a particle and rigid body.

- to study about couples and moments of couples and results related to them.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	find the resultant of two or more forces acting on a particle	**A**
CO2	understand the concepts of equilibrium of a particle under three or more forces.	**U**
CO3	compute the moment of a force and a couple.	**U**
CO4	obtain the equation of the line of action of the resultant.	**A**
CO5	comprehend the effect of friction on planar motion.	**R**
CO6	identify the centre of mass for different geometrical figures.	**R**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I	**11 hrs**

Force: Newton's laws of motion – Forces – Resultant of two forces on a particle – Resultant of three forces related to a triangle acting at a point – Resultant of several forces acting on a particle. **Equilibrium of a particle**: Equilibrium of a particle – Equilibrium of a particle under three forces – Equilibrium of a particle under several forces.

Chapter 2: Sections 2.1(2.1.1) - 2.2, Chapter 3: Section 3.1

Unit II	**10 hrs**

Forces on a rigid body: Moment of a force – Moment of a force about a line **–** Scalar moment **–** Equivalent (or equipolent) systems of forces **–** Parallel forces **–** Point of application of resultant of many parallel forces **–** Varignon's theorem **–** Parallel forces at the vertices of a triangle **–** Forces along the sides of a triangle.

Chapter 4: Sections 4.1, 4.3 - 4.5

Unit III	**11 hrs**

Forces on a rigid body: Couples **–** Moment of a couple **–** Arm and axis of a couple – Resultant of several coplanar forces – Moment of a certain couple as an area – Couples in a parallel planes – Resultant of a couple and a force – Equation of the line of action of the resultant – Sum of the moments about an arbitrary point.

Chapter 4: Sections 4.6 - 4.8

Unit IV	**10 hrs**

Force: **Newton's laws of motion**: Types of forces. **A specific reduction of forces**: Problems involving frictional forces.

Chapter 2: Section 2.1(2.1.2), Chapter 5: Section 5.2 (Excluding Section 5.2.1)

Unit V	**10 hrs**
Centre of Mass: Centre of mass – Centre of gravity – Finding mass centre – Finding mass centre (not using integration) – Finding mass centre using integration – Mass centre of a nonhomogeneous solid. Chapter 6: Section 6.1(6.1.1), 6.2(6.2.1 - 6.2.3)	

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Mechanics	P. Duraipandian, Laxmi Duraipandian, Muthamizh Jayapragasam	S. Chand & Company Ltd., Reprint 2016.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Statics	Dr.M.K.Venkataraman	Agasthiar book deport, Fifth edition, 1984.
2	Statics	K.ViswanathaNaik, M.S.Kasi	Emerald publishers, 2001.

B.Sc Mathematics

Semester III

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part IV – Non-Major Elective Basic Mathematics for Competitive Examinations	**Course Code: 317NMC**
Semester: III	**No. of Credits: 2**
No. of hours : 30 (Total hours)	**C:T: 26: 4**
CIA Max. Marks: 50	**ESE Max. Marks: -**

(C: Contact hours, T:Tutorial)

Course Objectives:

Objectives of this course are

- to enhance quantitative aptitude required for competitive examinations like Bank P.O., and Railways etc.
- to familiarize with different types of tests conducted by various examining bodies.
- to improve the numerical aptitude in mathematics and to increase the speed through regular practice.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	simplify fractions easily.	**R**

CO2	acquire enough knowledge to solve problems on ages and profit and loss.	**A**
CO3	solve problems in ratio and proportion and partnership.	**A**
CO4	gain knowledge in solving problems involving time and other factors.	**R**
CO5	calculate simple interest, compound interest and true discount.	**A**
CO6	improve their numerical aptitude	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I	**6 hrs**
Decimal fractions – Simplification – Number series. Chapters: 3, 4, 39	

Unit II	**5 hrs**
Problems on Ages – Percentage – Profit and loss. Chapters: 8, 10, 11	

Unit III	**5 hrs**
Ratio and proportion – Partnership Chapters: 12,13	

Unit IV	**5 hrs**
Time and work – Time and distance – Problems on trains. Chapters: 15, 17, 18	

Unit V	**5 hrs**
Simple interest – Compound interest – True discount. Chapters: 21, 22, 25	

Book for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I-V	Objective Arithmetic	R.S. Aggarwal	S.Chand & Company LTD, Reprint 2009.

Books for Reference:

S.No	**Name of the Book**	**Authors**	**Publishers with Edition**
1	Quick Arithmetic	Shish Aggarwal	Sultan Chand & Company Ltd, Second edition 2007.
2	Quantitative Aptitude for Competitive Examinations	Abhijit Guha	Tata McGraw Hill Publishing Company Ltd, Fifth edition, 2014.

B.Sc Mathematics

Semester IV

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core VII Discrete Mathematics	**Course Code: 417M07**
Semester: IV	**No. of Credits: 3**
No. of hours :45 (Total hours)	**C:T: 39:6**
CIA Max. Marks: 25	**ESE Max. Marks: 50**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to develop the ability to perceive, formulate and to solve mathematical problems related to finite systems in engineering and computer science.
- to gain confidence in applying the ideas to solve practical problems in the areas like switching theory, coding theory, artificial intelligence etc.,
- to develop appropriate interpretation of finite Mathematical systems.

Course Outcomes: On completion of the Course the student will be able to

CO	**Statement**	**Bloom's Taxonomy level**
CO1	know various connectives in logic.	**R**
CO2	construct truth table for statement formulae	**A**
CO3	convert the statement formulae to its equivalent forms.	**U**
CO4	characterize posets, semigroups and monoids.	**A**
CO5	examine the concepts of lattices and Boolean algebra.	**U**
CO6	minimize Boolean functions	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I	**8 hrs**

Mathematical logic: Introduction – Statements and Notation. Connectives: Negation – Conjunction – Disjunction – Statement formulas and truth tables – Conditional and Biconditional – Well-formed Formulas – Tautologies – Equivalence of formulas – Duality law – Tautological Implications – Formulas with Distinct Truth Tables.

Chapter 1: Sections 1.1, 1.2(1.2.1-1.2.4, 1.2.6 - 1.2.12)

Unit II	**8 hrs**

Mathematical logic: Normal forms: Disjunctive normal forms – Conjunctive normal forms – Principal disjunctive normal forms – Principal conjunctive normal forms – Ordering and uniqueness of normal forms. **Set theory**: Relations and ordering: Partial ordering – Partially ordered set: Representation and Associated Terminology.

Chapter 1: Sections 1.3(1.3.1 - 1.3.5), Chapter 2: Sections 2.3(2.3.8, 2.3.9)

Unit III	**7 hrs**
Algebraic Structures: Semigroups and Monoids: Definitions and Examples – Homomorphism of Semigroups and Monoids – Subsemigroups and Submonoids. Chapter 3 : Section 3.2	

Unit IV	**8 hrs**
Lattices and Boolean Algebra: Introduction: Lattices as partially ordered sets: Definition and Examples – Some properties of lattices – Lattices as Algebraic systems – Sublattices, Direct Product, and Homomorphism – Some Special Lattices. Boolean Algebra: Definition and Examples. Chapter 4: Sections 4.1, 4.2(4.2.1)	

Unit V	**8 hrs**
Lattices and Boolean Algebra: Boolean Functions: Boolean Forms and Free Boolean Algebras – Values of Boolean Expressions and Boolean Functions. Representation andMinimization of Boolean functions: Representation of Boolean functions. Chapter 4: Sections 4.3, 4.4(4.4.1)	

Book for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I -V	Discrete Mathematical Structures with Applications to Computer Science	J.P. Tremblay and R. Manohar	Tata McGraw-Hill Edition – 1997, 47th Reprint 2015

Books for Reference:

S.No	**Name of the Book**	**Authors**	**Publishers with Edition**
1	Discrete Mathematics with Graph Theory and Combinatorics	T.Veerarajan	Tata McGraw–Hill, New Delhi, Fifth Reprint, 2008.
2	Discrete Mathematics	N.Ch.S.N.Iyengar, V.M.Chandrasekaran, K.A.Venkatesh, P.S. Arunachalam	Vikas Publishing House Pvt Ltd, Second Reprint, 2008
3	Discrete Mathematics (For B.E. Computer Science and Engineering)	Prof. V.Sundaresan, K.S.Ganapathy Subramanian, K.Ganesan	A.R. Publications (New Revised Edition, June 2008)
4	Discrete Mathematical Structures	Bernard Kolman, Robert C.Busby and Sharon Ross	Prentice Hall of India Pvt Ltd, Sixth Printing (Third Edition), 1998

B.Sc Mathematics

Semester IV

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core VIII Dynamics	**Course Code: 417M08**
Semester: IV	**No. of Credits: 4**
No. of hours :60 (Total hours)	**C:T: 52:8**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

Objectives of this course are

- to visualize the physical phenomena in mathematical terms.
- to have a deep knowledge about the motion of particles under the influence of various forces.
- to impart the concept of impact of collision of bodies and solve problems based on it.
- to provide a good foundation for the students to take up any advanced course in mechanics and all related fields

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	Interpret and illustrate the basic concepts in Kinematics	**U**
CO2	gain knowledge about simple harmonic motion and its application in Physical situation.	**A**
CO3	recall various properties of a projectile	**R**
CO4	describe and evaluate direct and oblique impact of bodies.	**U**
CO5	describe the properties of the central orbits.	**R**
CO6	analyze the effects of forces on material bodies	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I	**11 hrs**
Kinematics: Basic units – Velocity – Velocity of particle describing a circle – Resultant velocity – Acceleration – Rectilinear motion – Rectilinear motion with a constant acceleration – Coplanar motion – Velocity and acceleration in a coplanar motion – Angular velocity – Relative angular velocity. Chapter 1: Sections 1.1 - 1.4 (excluding Section 1.2.3)	

Unit II	**10 hrs**
Rectilinear motion under varying force: Simple harmonic motion – Projection of a particle having a uniform circular motion – Composition of two simple harmonic motions of same period – S.H.M along a horizontal line – S.H.M along a vertical line. Chapter 12: Sections 12.1 - 12.3	

Unit III	**11 hrs**
Projectiles: Forces on a projectile – Displacement as a combination of vertical and horizontal displacements – Nature of trajectory – Results pertaining to the motion of a projectile – Maximum horizontal range for a given velocity – Two trajectories with a given speed and range – Projectile projected horizontally – Projectile projected on an inclined plane – Maximum range on an inclined plane. Chapter 13: Sections 13.1, 13.2	

Unit IV	**10 hrs**
Impact: Conservation of linear momentum(principle only) – Impact of spheres – Laws of impact – Impact of two smooth spheres – Direct impact of two smooth spheres – Impact of a smooth sphere on a plane – Direct impact of a smooth sphere on a plane – Oblique impact of a smooth sphere on a plane – Oblique impact of two smooth spheres. Chapter 14: Sections 14.2 - 14.5	

Unit V	**10 hrs**
Central orbits: General orbits – Central orbit – Differential equation of a central orbit – Laws of a central force – Methods to find the central orbits – Conic as a central orbit – Kepler's Laws of planetary motion. Chapter 16: Sections 16.1 - 16.3	

Book for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I-V	Mechanics	P. Duraipandian, Laxmi Duraipandian, Muthamizh Jayapragasam	S. Chand & Company Ltd., Reprint 2016.

Books for Reference:

S.No	**Name of the Book**	**Authors**	**Publishers with Edition**
1	Dynamics	A.V. Dharmapadam	S. Viswanathan Pvt Ltd., 2006
2	Dynamics	S. Narayanan	S. Chand & Company Ltd., 16th revised edition 1986
3	Dynamics	Dr. M.K. Venkataraman	Agasthiar publications, 12th edition 2006

B.Sc Mathematics

Semester V

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core IX Real Analysis I	**Course Code: 517M09**
Semester: V	**No. of Credits: 4**
No. of hours :90 (Total hours)	**C:T: 75:15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to provide a smooth transition from elementary calculus to advanced topics in the theory of real variables.
- to apply the concepts of calculus to geometrical and physical problems in higher dimensional spaces.
- to expose the properties of limit and continuity which are indispensable to the study of subjects such as optimization theory.
- to impart adequate knowledge about functional relationships between the variables which have more applications in expressing the laws of physics, chemistry, mechanics etc.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	apply the properties of real numbers.	**A**
CO2	acquire the knowledge of sets, relations and functions.	**R**
CO3	classify the countable, uncountable, open, closed and compact sets.	**U**
CO4	interpret the properties of sets in Metric spaces.	**U**
CO5	analyse the nature of sets under limits and continuity.	**A**
CO6	identify the relation between completeness and compactness of sets in metric space.	**R**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**16 hrs**
The real and complex number systems: Introduction – The field axioms – The order axioms – Geometric representation of real numbers – Intervals – Integers – The unique factorization theorem for integers – Rational numbers – Irrational numbers – Upper bounds, maximum element, least upper bound – The completeness axiom – Some properties of the supremum – Properties of the integers deduced from the completeness axiom – The Archimedean property of the real number system – Rational numbers with finite decimal representation – Finite decimal approximations to real numbers – Infinite decimal representation of real numbers – Absolute values and the triangle inequality – The Cauchy-Schwarz inequality – Plus and minus infinity and the extended real number system R – Simple problems. Chapter 1: Sections 1.1 - 1.20	

Unit II	**16 hrs**
Some basic notations of set theory: Introduction – Notations – Ordered pairs – Cartesian product of two sets – Relations and functions – Further terminology concerning functions –	

One to one functions and inverses – Composite functions Sequences – Similar sets – Finite and infinite sets – Countable and uncountable sets – Uncountability of the real number system – Set algebra – Countable collections of countable sets – Simple problems.

Chapter 2: Sections 2.1 - 2.15

Unit III **16 hrs**

Elements of point set Topology: Introduction – Euclidean space R^n – Open balls and open sets in R^n – The structure of open sets in R^1 – Closed sets – Adherent points, Accumulation points – Closed sets and adherent points – The Bolzano-Weierstrass theorem – The Cantor intersection theorem.

Chapter 3: Sections 3.1 - 3.9

Unit IV **15 hrs**

Elements of point set Topology: The Lindel of covering theorem – The Heine-Borel covering theorem – Compactness in R^n – Metric Spaces – Point set Topology in metric spaces – Compact subsets of a metric space – Boundary of a set – Simple problems.

Chapter 3: Sections 3.10 - 3.16

Unit V **15 hrs**

Limits and Continuity: Introduction – Convergent sequences in a metric space – Cauchy sequences – Complete metric spaces – Limit of a function – Limits of complex-valued functions – Limits of vector valued functions – Continuous functions – Continuity of composite functions – Continuous complex valued and vector valued functions – Examples of continuous functions – Continuity and inverse images of open or closed sets – Functions continuous on compact sets – Topological mappings – Bolzano's theorem.

Chapter 4: Sections 4.1 - 4.15

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Mathematical Analysis	Tom M.Apostol	Narosa Publishing House, Second Edition, Twentieth Reprint 2002.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1.	Principles of Mathematical Analysis	Walter Rudin	McGraw Hill, Third Edition, 1976.
2.	Source book on Real Analysis part I	M.S.Rangachari	New Century Book House (P) Ltd, 1996
3.	Modern Analysis	Arumugam, Isaac	New Gamma Publishing

			House, 1994

SMathematics

Semester V

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core X Complex Analysis I	**Course Code: 517M10**
Semester: V	**No. of Credits: 4**
No. of hours : 75 (Total hours)	**C:T: 65:10**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C: Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to enable the students to understand the important concepts such as continuity, differentiability and analyticity of complex function with appropriate illustrations.
- to introduce analytic functions and its properties in the complex plane
- to impart adequate knowledge about power series in complex plane.
- to study about the elementary transformations

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	specify the geometric properties of the complex number system.	**R**
CO2	analyze differentiability of complex functions in various domains.	**A**
CO3	identify analytic and harmonic functions.	**R**
CO4	derive and apply bilinear transformations and cross ratio.	**A**
CO5	examine the convergence of power series.	**A**
CO6	express exponential, trigonometric, hyperbolic and logarithmic functions in terms of power series	**U**
CO7	describe the transformation of various curves and regions in the complex plane under elementary analytic functions.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**13 hrs**
Complex Numbers: Introduction – Complex Numbers – Conjugation and Modulus – Inequalities – Square Root – Geometrical Representation of Complex Numbers – n^{th} Roots of Complex Numbers – Circles and Straight Lines – Regions in the Complex Plane – The Extended Complex Plane. Chapter 1: Sections 1.0 - 1.9	

Unit II	**13 hrs**

Analytic Functions: Introduction – Functions of a Complex variable – The Cauchy-Riemann Equations – Analytic Functions – Harmonic Functions – Conformal mapping.
Chapter 2: Sections 2.0, 2.1, 2.6 - 2.9

Unit III **13 hrs**

Bilinear transformations: Introduction – Elementary Transformations – Bilinear Transformations – Cross Ratio – Fixed points of Bilinear Transformations – Some special Bilinear Transformations.
Chapter 3: Sections 3.0 - 3.5

Unit IV **13 hrs**

Power Series: Introduction – Sequences and Series – Sequences and Series of Functions – Power Series–Elementary Functions.
Chapter 4: Sections 4.0 - 4.4

Unit V **13 hrs**

Mapping by Elementary Functions: Introduction – The Mappings $\omega = z^2$, $\omega = z^n$ where n is a positive integer, $\omega = e^z$, $\omega = \sin z$, $\omega = \cos z$, $\omega = \cosh z$, $\omega = \frac{1}{2}\left(z + \frac{1}{z}\right)$.
Chapter 5: Sections 5.0 - 5.7

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I - V	Complex Analysis	S.Arumugam, A.Thangapandi Isaac, A.Somasundaram	Scitech publications (India) Pvt ltd, Reprint 2012

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1.	Complex Analysis	V.Karunakaran	Narosa Publishing House, 2002.
2.	Complex Analysis	P.Duraipandian, Laxmi Duraipandian and D.Muhilan	Emerald publishers, Revised edition Reprint 2006

B.Sc Mathematics

Semester V

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core XI Abstract Algebra	**Course Code: 517M11**
Semester: V	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: 65:10**

CIA Max. Marks: 25	ESE Max. Marks: 75

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to introduce the basics of group theory.
- to relate different algebraic structures like rings, fields and ideals.
- to gain deep knowledge in the structure preserving mappings like homomorphism, isomorphism etc.
- to possess deep knowledge in the field of quotients of an integral domain and Euclidean rings

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	acquire knowledge about mapping and Euclidean algorithm.	**R**
CO2	acquire knowledge about the concept of rings and their basic properties.	**R**
CO3	classify the properties of different algebraic structures.	**U**
CO4	characterize the mappings between algebraic structures.	**A**
CO5	discuss the structure preserving mappings like homomorphism, isomorphism etc. .	**U**
CO6	solve the problems related to algebraic structures.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**13 hrs**
Preliminary Notions: Mappings – The integers (unique factorization theorem statement only). **Group Theory**: Definition of a Group – Some Examples of Groups – Some preliminary Lemmas – Sub groups – Simple problems. Chapter 1: Sections 1.2, 1.3, Chapter 2: Sections 2.1 - 2.4	

Unit II	**13 hrs**
Group Theory: A Counting principle – Normal subgroups and quotient groups – Homomorphisms – Simple problems. Chapter 2: Sections 2.5 - 2.7	
Unit III	**13 hrs**
Group theory: Automorphisms – Cayley's theorem – Permutation groups – Simple problems. Chapter 2: Sections 2.8 - 2.10	

Unit IV	**13 hrs**

Ring Theory: Definitions and examples of rings – Some special classes of rings – Homomorphisms – Ideals and quotient rings – Simple problems. Chapter 3: Sections 3.1 - 3.4

Unit V	**13 hrs**
Ring Theory: More ideals and quotient rings – The field of quotients of an integral domain –Euclidean rings – Simple problems. Chapter 3: Sections 3.5 - 3.7	

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I- V	Topics in Algebra	I.N. Herstein	Wiley India pvt limited, Second Edition Reprint 2015.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1.	Basic Abstract Algebra	P.B.Bhattacharya, S.k.Jain, S.R.Nagpoul	Cambridge University press, Second Edition, Reprint 2004.
2.	A First Course in Abstract Algebra	John B. Fraleigh	Addition Wesley Publishing Company, Fifth printing 2003

B.Sc Mathematics

Semester VI

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core XIII Real Analysis II	**Course Code: 617M13**
Semester: VI	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: 65:10**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to impart knowledge and understanding in the advanced topics such as Riemann-Stieltjes integral, Functions of bounded variables.
- to study derivatives of higher dimensional spaces.
- to extend the mean value theorem and Taylor's formula for higher dimensional spaces which have many applications in optimization theory.
- to know the applications of the ideas that are being studied in differentiation to integral equations, differential equations and function spaces.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	explain and illustrate the connectedness of metric spaces and its relation to continuity of functions.	**U**

CO2	describe the concept of uniform continuity and compact sets.	**U**
CO3	gain a complete knowledge of derivatives and apply them appropriately .	**A**
CO4	analyze various properties of monotonic functions and functions of bounded variation.	**A**
CO5	recognize the impact of monotonicity and bounded variation in Riemann- Stieltjes Integral.	**R**
CO6	relate upper and lower integrals with Riemann- Stieltjes Integral.	**R**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**13 hrs**

Limits and Continuity: Connectedness – Components of a metric space – Arcwise connectedness – Uniform continuity – Uniform continuity and compact sets – Fixed point theorem for contractions – Discontinuities of real valued functions – Monotonic functions – Simple problems.

Chapter 4: Sections 4.16 - 4.23

Unit II	**13 hrs**

Derivatives: Introduction – Definition of derivative – Derivatives and continuity – Algebra of derivatives – The chain rule – One sided derivatives and infinite derivatives – Functions with nonzero derivative – Zero derivatives and local extrema – Rolle's theorem – The Mean–Value theorem for derivatives – Intermediate value theorem for derivatives – Taylor's formula with remainder – Simple problems.

Chapter 5: Sections 5.1 - 5.12

Unit III	**13 hrs**

Functions of bounded variation and Rectifiable curves: Introduction – Properties of Monotonic functions – Functions of bounded variation – Total Variation – Additive property of Total Variation – Total Variation on [a, x] as a function of x – Functions of bounded variation expressed as the difference of increasing functions – Continuous functions of bounded variation.

Chapter 6: Sections 6.1 - 6.8

Unit IV	**13 hrs**

The Riemann-Stieltjes integral: Introduction – Notation – The definition of the Riemann-Stieltjes integral – Linear Properties – Integration by parts – Change of Variable in a Riemann-Stieltjes integral – Reduction to a Riemann integral – Step functions as integrators – Reduction of a Riemann-Stieltjes integral to a finite sum – Euler's summation formula – Simple problems.

Chapter 7: Sections 7.1 - 7.10

Unit V	**13 hrs**

The Riemann-Stieltjes integral: Monotonically increasing integrators. Upper and Lower

integrals – Additive and linearity properties of upper and lower integrals – Riemann's condition – Comparison theorems – Integrators of bounded variation – Sufficient conditions for existence of Riemann-Stieltjes integral – Necessary conditions for existence of Riemann-Stieltjes integral – Simple problems. Chapter 7: Sections 7.11 - 7.17

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I – V	Mathematical Analysis	Tom M.Apostol	Narosa Publishing House, Second Edition, Twentieth Reprint 2002.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Principles of Mathematical Analysis	Walter Rudin	McGraw Hill, Third Edition, 1976.
2	Source book on 'Real Analysis part I	M.S.Rangachari	New Century Book House (P) Ltd, 1996
3	Source book on 'Real Analysis part II	G.Rangan	New Century Book House (P) Ltd, 1998

B.Sc Mathematics

Semester VI

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core XIV Complex Analysis II	**Course Code: 617M14**
Semester: VI	**No. of Credits: 4**
No. of hours : 75 (Total hours)	**C:T: 65:10**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to comprehend the fundamental concepts of complex analysis.
- to apply the techniques of complex analysis to problems in mathematics and physics.
- to examine the analytic functions of complex variables which are closely connected in solving Laplace equation, to which numerous problems of mechanics and physics reduce.
- to apply residues in evaluating integrals.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	understand the basic idea of complex integration.	**U**
CO2	derive and apply various Cauchy's integral formulae.	**A**
CO3	express a given function as a power series in the defined region.	**U**
CO4	identify and classify the singular points and the behaviour of a function in the neighbourhood of a singular point.	**R**

CO5	acquire knowledge about the residue of a function and various methods to find the same.	**A**
CO6	derive and apply Cauchy residue theorem to evaluate certain types of real definite integrals.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**13 hrs**
Complex Integration: Introduction – Definite integral – Cauchy's Theorem. Chapter 6: Sections 6.0 - 6.2	

Unit II	**13 hrs**
Complex Integration: Cauchy's Integral Formula – Higher Derivatives. Chapter 6: Sections 6.3 and 6.4	

Unit III	**13 hrs**
Series Expansions: Introduction – Taylor's Series – Laurent's Series. Chapter 7: Sections 7.0 - 7.2	

Unit IV	**13 hrs**
Series Expansions: Zeros of an Analytic function – Singularities. **Calculus of Residues:** Introduction – Residues. Chapter 7: Sections 7.3 and 7.4. Chapter 8: Sections 8.0 and 8.1	

Unit V	**13 hrs**
Calculus of Residues: Cauchy's Residue Theorem – Evaluation of Definite Integrals. Chapter 8: Sections 8.2 and 8.3	

Book for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I -V	Complex Analysis	S.Arumugam, A.Thangapandi Isaac, A.Somasundaram	Scitech publications (India) Pvt ltd, Reprint 2012

Books for Reference:

S.No	**Name of the Book**	**Authors**	**Publishers with Edition**
1	Complex Analysis	V.Karunakaran	Narosa Publishing House, 2002.
2	Complex Analysis	P.Duraipandian, Laxmi Duraipandian and D.Muhilan	Emerald publishers, Revised edition Reprint 2006

B.Sc Mathematics
Semester VI

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core XV Linear Algebra	**Course Code: 617M15**
Semester: VI	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: 65:10**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to introduce a new algebraic structure, vector space and its concepts, like linear dependence, basis, dimension etc., which have wide applications in many branches of mathematics.
- to distinguish various algebraic structures.
- to introduce many types of matrices which are useful for representing problems in an efficient way.
- to infer the relationship between the linear transformation in vector spaces and matrices.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	find basis, linear independence and dimension in a vector space.	**U**
CO2	relate the concept of dual space and the notion of an inner product space.	**R**
CO3	identify the algebra of linear transformations and the matrix of a linear transformation.	**R**
CO4	acquire knowledge about the types of linear transformations and their properties.	**A**
CO5	discuss about the types of matrices	**U**
CO6	apply the concept of characteristic roots and characteristic vectors of a square matrix.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**13 hrs**
Vector Spaces and Modules: Elementary basic concepts – Linear Independence and bases – Simple problems. Book 1: Chapter 4: Sections 4.1 and 4.2	

Unit II	**13 hrs**
Vector Spaces and Modules: Dual spaces – Inner product spaces – Simple problems. Book 1: Chapter 4: Sections 4.3 and 4.4	

Unit III	**13 hrs**
Linear Transformations: The Algebra of Linear Transformations – Characteristic Roots – Matrices – Simple problems. Book 1: Chapter 6: Sections 6.1 - 6.3	

Unit IV	**13 hrs**

Linear Transformations: Hermitian, Unitary and Normal Transformations – Simple problems. Book 1: Chapter 6: Section 6.10

Unit V	**13 hrs**
Matrices: Symmetric and Skew-Symmetric matrices – Hermitian and Skew-Hermitian matrices – Orthogonal and Unitary matrices. **Linear Transformations of Vector spaces:** Characteristic Roots and Characteristic Vectors of a square matrix– Simple problems. Book 2: Chapter 1: Sections 1.7 - 1.9. Chapter 3: Section 3.9	

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I - IV	Topics in Algebra	I.N. Herstein	Wiley India Pvt limited, Second Edition Reprint 2015.
V	A Text Book of Modern Algebra	R. Balakrishnan and N. Ramabhadran	Vikas Publishing House Pvt Ltd, Third edition, 1979.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Modern Algebra	Surjeet Singh and Qazi Zameerudin	Vikas Publishing House, Third Edition, 1979.
2	A Text book in Modern Algebra	R.S. Aggarwal	S.Chand and company Ltd, New Delhi, 1996.
3	Linear Algebra Theory & Applications	Ward Cheney, David Kincaid	Raj Press, New Delhi, Second Edition

B.Sc Computer Science / BCA /B.Sc (IT)

Semester II

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Allied II Discrete Mathematics	**Course Code: 217AS2/217AK2/217AG2**
Semester: II	**No. of Credits: 4**
No. of hours :90 (Total hours)	**C:T : 75 : 15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to develop the ability to perceive, to formulate and to solve mathematical problems related to finite systems in engineering and computer science.
- to gain confidence in applying the ideas to solve practical problems in the areas like switching theory, coding theory, artificial intelligence etc.,
- to provide some methods for analyzing the real world problems involving shortest distances.
- to use finite-state machines to model computer operations.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	construct truth table and normal forms for statement formulae using connectives in logic	**U**
CO2	distinguish relations and functions	**U**
CO3	examine the concepts of lattices and Boolean algebra.	**U**
CO4	minimize Boolean functions	**A**
CO5	identify Hamiltonian and Eulerian graphs.	**R**
CO6	use matrix representation of graphs to determine shortest path.	**A**
CO7	identify different types of phrase structure grammars.	**R**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**15 hrs**
Mathematical Logic: Connectives : Negation – Conjunction – Disjunction – Statement Formulas and Truth Tables – Conditional and Biconditional – Well-formed Formulas – Tautologies – Equivalence of Formulas – Duality Law. **Normal forms:** Disjunctive Normal Forms – Conjunctive Normal Forms – Principal Disjunctive Normal Forms – Principal Conjunctive Normal Forms. **The Theory of Inference for Statement Calculus:** Validity using Truth tables – Rules of Inference – Consistency of Premises and Indirect Method of proof. Book 1: Chapter 1: Sections 1.2(1.2.1-1.2.4, 1.2.6-1.2.10), 1.3(1.3.1-1.3.4), 1.4 (1.4.1 -1.4.3)	

Unit II	**15 hrs**
Set Theory: Relations and Ordering: Relations – Properties of Binary Relations in a set – Relation Matrix and Graph of a Relation – Equivalence Relations – Composition of Binary Relations. **Functions:** Definition and Introduction – Composition of Functions – Inverse Functions. Book 1: Chapter 2: Sections 2.3(2.3.1- 2.3.3, 2.3.5, 2.3.7), 2.4(2.4.1- 2.4.3)	

Unit III	**15 hrs**
Set Theory: Lattices – Principle of Duality – Properties of Lattices – Lattice as Algebraic System – Sublattices – Lattice Homomorphism – Some Special Lattices. Boolean Algebra – Additional Properties of Boolean Algebra – Dual and Principle of Duality – Karnaugh Map Method. Worked Examples (Related to the above topics). Book 2: Pages: 96 - 108, 114 - 118, 120 - 155	

Unit IV	**15 hrs**

Graph Theory: Introduction – Basic Definitions – Degree of a vertex – Some Special Simple Graphs – Matrix Representation of Graphs – Paths, Cycles and Connectivity – Eulerian and Hamiltonian Graphs – Connectedness in Directed Graphs – Shortest Path Algorithms. Book 2 : Pages: 366 - 414

Unit V	**15 hrs**
Formal Languages and Automata Theory: Introduction – Phrase Structure Grammar – Types of Phrase-Structure Grammar – Backus-Naur Form (BNF) – Finite-State Machine – Input and Output Strings for FSM – Finite State Automata (FSA). Book 2: Pages 448 - 490	

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I , II	Discrete Mathematical Structures with applications to Computer Science	J.P.Tremblay and R. Manohar	McGraw – Hill Edition, 1997, 47th Reprint 2015.
III - V	Discrete Mathematics with Graph theory and Combinatorics	T. Veerarajan	Tata McGraw– Hill Publishing Company Ltd. Tenth Reprint 2010.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Discrete Mathematical Structures	R.M.Somasundaram	PHI Learning Private Limited, Sixth Printing, October 2009.
2	Discrete Mathematics (For B.E. Computer Science and Engineering)	Prof.V.Sundaresan, K.S.Ganapathy Subramanian, K.Ganesan	A.R.Publications (New Revised Edition, June 2008)

B.Com/B.Com (CA)/B.Com (e-Commerce)

Semester IV

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: **Allied IV – Statistics**	**Course Code: 417AB4/417AR4/417AN4**
Semester: IV	**No. of Credits: 4**
No. of hours : 90	**C:78 T: 12**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C: Contact hours, T: Tutorial)

Course Objectives:

- C_1: To impart knowledge on theoretical concepts of statistics.
- C_2: To provide knowledge on methods of diagrammatic and graphic representation.

- C_3: To acquaint knowledge on statistical tools available for analysis.
- C_4: To understand the applications of statistical techniques in business.

Course Outcomes: On completion of the Course the student will be able to:

CO	Statement	Bloom's Taxonomy level
CO1	Comprehend the basic concepts of statistics.	R
CO2	Discuss the methods of sampling.	U
ÇO3	Create, read and interpret graphs, charts, histograms and diagrams.	A
CO4	Use basic measures of central tendency and variation.	A
CO5	Interpret the relationship between two variables in statistical terms.	U
CO6	Apply knowledge of statistical tools in business data analysis.	A

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I :Statistics (Theory Only) **15 hrs**
Definition – Functions – Scope – Limitations. Statistical Enquiry – Collection of Data: Methods, Sources of data.

Unit II:Sampling techniques (Theory Only) **15 hrs**
Principles - Methods of Sampling. Classification and Tabulation of Data.

Unit III : Diagrammatic and Graphic representation and measures of Central Value (Problem Only) 16 hrs
Diagrammatic and Graphic representation. Measures of Central Value: Mean, Median, Mode, Geometric mean, Harmonic mean, Quartiles and deciles.
Unit IV :Measures of Variation (Problem Only) 16 hrs
Range, Quartile deviation, Average deviation and Standard Deviation – Coefficient of Variation.

Unit V: Correlation Analysis & Regression Analysis(Problem Only) 16 hrs
Types of correlation: Simple Correlation – Rank Correlation. Regression: Method of Least Squares.

Note: Distribution of marks for Theory and Problem shall be 40% and 60% respectively.

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I – V	Elementary Statistical Methods	S.P.Gupta	Sultan Chand and Sons, New Delhi Ed. 2014

Book for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1.	Statistics Theory and Practice	S.P.Gupta	S. Chand and company, New Delhi Ed. 2016

Entrepreneurship Courses

B.Sc. Mathematics

Semester VI

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Elective II Operations Research	**Course Code: 617ME3**
Semester: VI	**No. of Credits: 4**
No. of hours : 90 (Total hours)	**C:T: 75:15**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The prime objectives for introducing this course are:

- to gain knowledge on techniques for solving linear programming problem.
- to identify the optimum allocation of resources to respective destination.
- to assign suitable resources to respective jobs.
- to apply optimization in networks.
- to develop knowledge in basic techniques to deal with inventory

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	recall the basic concepts of Linear Programming Problems and solve them	**A**
CO2	explain the concept of Duality and its applications	**R**
ÇO3	minimize the cost in transportation problems and assignment problems	**A**
CO4	determine the appropriate order for a series of jobs to be done on a finite number of service facilities	**U**
CO5	apply the optimization techniques in inventory control.	**A**
CO6	demonstrate the applications of various optimization tools to the real life problems involving networks.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I	**15 hrs**
Linear Programming Problem – Graphical solution and Extension: Introduction –	

Graphical solution method – Some exceptional cases – General linear programming problem – Canonical and standard forms of L.P.P. **Linear programming problem – Simplex method**: Introduction – Fundamental properties of solutions – The computational procedure – Use of artificial variables.

Chapter 3: Sections 3.1 - 3.5, Chapter 4: Sections 4.1 - 4.4

Unit II **15 hrs**

Duality in Linear Programming: Introduction – General Primal-Dual pair – Formulating a dual problem – Primal-Dual pair in matrix form – Duality and Simplex method. **Transportation Problem**: Introduction – LP formulation of the transportation problem – Existence of Solution in T.P – Duality in transportation problem – The transportation table – Loops in transportation tables – Triangular basis in a T.P – Solution of a transportation problem – Finding an initial basic feasible solution – Test for optimality – Economic Interpretation of u_j's and v_j's – Degeneracy in transportation problem – Transportation algorithm [MODI method]. **Assignment Problem**: Introduction – Mathematical formulation of the problem – Solution Methods of Assignment Problem.

Chapter 5: Sections 5.1 - 5.4, 5.7 Chapter 10: Sections 10.1 - 10.13

Chapter 11: Sections 11.1 - 11.3

Unit III **15 hrs**

Sequencing Problem : Introduction-Problem of Sequencing-Basic terms used in Sequencing- Processing n jobs through two machines- Processing n jobs through k machines – Processing 2 jobs through k machines.

Chapter 12: Sections 12.1 -12.6

Unit IV **15 hrs**

Inventory Control – I: Introduction – Types of Inventories – Reasons for carrying Inventories – The inventory decisions – Objectives of Scientific Inventory Control – Costs associated with inventories – Factors affecting inventory control – An Inventory Control Problem – The Concept of EOQ – Deterministic inventory problems with No shortages – Deterministic inventory problems with shortages – Problems of EOQ with Price Breaks.

Chapter 19: Sections 19.1 - 19.12

Unit V **15 hrs**

Network Scheduling by PERT/CPM: Introduction – Network: Basic Components – Logical Sequencing – Rules of Network Construction – Concurrent Activities – Critical path analysis – Probability considerations in PERT – Distinction between PERT and CPM.

Chapter 25: Sections 25.1 - 25.8

Note: Only Statement of the theorems and Algorithms are included.

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I - V	Operations Research	Kanti Swarup, P.K	Sultan Chand & Sons, New Delhi,

		Gupta, Man Mohan	Eighteenth Edition, 2015.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Operations Research: Theory and Applications	J.K.Sharma	MacMillan India Ltd, Fourth Edition, 2010.
2	Operations Research: An Introduction	Hamdy A. Taha	Pearson India Pvt Ltd, 2016.

B.Sc Computer Science / BCA / B.Sc IT

Semester III

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Allied III Operations Research	**Course Code: 317AS3/317AK3/317AG3**
Semester: III	**No. of Credits: 4**
No. of hours :90 (Total hours)	**C:T : 75 : 15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to provide a practical training and to convert a managerial decision making problem to a linear programming problem
- to identify the optimum allocation of resources to respective destinations
- to accommodate suitable persons to respective jobs
- to select an appropriate order for a series of jobs to be done on a finite number of service facilities
- to develop logical reasoning in sequencing jobs in a network to trace the shortest route.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	know the basic concepts of linear programming	**R**
CO2	solve LPP using simplex method.	**A**
CO3	minimize the cost using transportation and assignment techniques.	**A**
CO4	compute optimum strategies in game theory	**U**
CO5	apply optimization in networks.	**A**
CO6	allocate the resources efficiently.	**U**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**15 hrs**
Linear Programming Problem – Graphical Solution and Extension: Introduction – Graphical Solution Method – Some Exceptional Cases – General Linear Programming Problem – Canonical and Standard Forms of L.P.P. **Linear Programming Problem –**	

Simplex Method: Introduction – Fundamental Properties of Solutions – The Computational Procedure.

Chapter 3: Sections 3.1 - 3.5 Chapter 4: Sections 4.1- 4.3

Unit II **15 hrs**

Transportation Problem: Introduction – LP Formulation of the Transportation Problem – Existence of Solution in T.P – Duality in Transportation Problem – The Transportation Table – Loops in Transportation Tables – Triangular Basis in a T.P – Solution of a Transportation Problem – Finding an Initial Basic Feasible Solution – Test for Optimality – Economic Interpretation of u_j's and v_j's – Degeneracy in Transportation Problem – Transportation Algorithm (MODI Method)

Chapter 10: Sections 10.1 - 10.13

Unit III **15 hrs**

Assignment Problem: Introduction – Mathematical Formulation of the Problem – Solution Methods of Assignment Problem. **Sequencing Problem:** Introduction – Problem of Sequencing – Basic Terms used in Sequencing – Processing n Jobs through Two Machines – Processing n jobs through k Machines – Processing 2 jobs through k machines.

Chapter 11: Sections 11.1 - 11.3, Chapter 12: Sections12.1 - 12.6

Unit IV **15 hrs**

Games and Strategies: Introduction – Two-Person Zero-Sum Games – Some Basic Terms – The Maximin-Minimax Principle – Games without Saddle Points – Mixed Strategies – Graphic Solution of 2×n and m×2 Games.

Chapter 17: Sections 17.1 - 17.6

Unit V **15 hrs**

Network Scheduling by PERT/CPM: Introduction – Network: Basic Components – Logical Sequencing – Rules of Network Construction – Concurrent Activities– Critical Path Analysis – Probability Considerations in PERT – Distinction between PERT and CPM.

Chapter 25: Sections 25.1 - 25.8

Note: Proof of the theorems and Derivations are not included.

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I - V	Operations Research	Kantiswarup, P.K.Gupta and Manmohan	Sultan chand & Sons, Eighteenth Edition 2015.

Books for Reference:

S. No	Name of the Book	Authors	Publishers with Edition
1	Operations Research: Theory and Applications	J.K.Sharma	MacMillan India Ltd, Second Edition, 2003

2	Operations Research: An Introduction	Hamdy A. Taha	Macmillan Publishing Company, Eighth Edition, 2008

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Semester III

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Allied III – Mathematics	**Course Code: 317AB3/317AR3/317AN3**
Semester: III	**No. of Credits: 4**
No. of hours :90 (Total hours)	**C:T: 75:15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to provide a knowledge about mathematics in finance.
- to improve the problem solving ability
- to give practical training in converting a managerial decision making problem to linear programming problem
- to gain knowledge on techniques for solving linear programming problem.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	calculate simple, compound interest, rate of interest etc.	**A**
CO2	perform various operations on matrices.	**U**
CO3	describe the concepts in Linear Programming Problem.	**R**
CO4	solve the linear programming problem using simplex method.	**A**
CO5	minimize the cost in transportation and assignment problems.	**U**
CO6	interpret the concept of game theory.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**16 hrs**
Mathematics of Finance: Basic Concepts – Simple Interest and Compound Interest – Symbols Used – Simple Interest – Formulae and Problems – Compound Interest – Formulae and Problems – Effective Rate and Nominal Rate of Interest – Depreciation – Annuities – Discounting. Book 1: Chapter 2: Sections 1 - 7, 10	

Unit II	**16 hrs**

Matrices, Determinants, Input - Output Analysis: Definition of a Matrix – Importance – Notation – Order of a Matrix – Types of Matrices – Matrix operations-I – A System of Linear Equations. Determinants – Matrix operations-II – Rank – Consistency of a System of Simultaneous Linear Equations – Miscellaneous Illustrations.

Book 1: Chapter 4: Sections 1 - 12

Unit III **15 hrs**

Linear Programming: Linear Programming Problem – Graphical Method – Simplex Method.

Book 1: Chapter 9 (Related to the above topics)

Unit IV **16 hrs**

Transportation Problem: Introduction – LP formulation of the transportation problem – Existence of Solution in T.P – Duality in transportation problem – The transportation table – Loops in transportation tables – Triangular basis in a T.P – Solution of a transportation problem – Finding an initial basic feasible solution – Test for optimality – Economic Interpretation of u_j's and v_j's – Degeneracy in transportation problem – Transportation algorithm [MODI method]. **Assignment Problem**: Introduction – Mathematical formulation of the problem – Solution Methods of Assignment Problem.

Book 2: Chapter 10: Sections 10.1 – 10.13, Chapter 11: Sections 11.1 – 11.3

Unit V **15 hrs**

Games and Strategies: Introduction – 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.

Book 2 : Chapter 17: Sections 17.1 - 17.6

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I ,II & III	Business Mathematics and Statistics	P.A.Navnitham	Jai Publishers, Latest Edition, May 2014.
IV & V	Operations Research	Kanti Swarup, P.K Gupta, Man Mohan	Sultan Chand & Sons, NewDelhi, Fifteenth Edition, Reprint 2010

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	An Introduction to Business Mathematics	V.Sundaresan, S.D.Jayaseelan	S.Chand & Company Ltd., New Delhi, Reprinted 1983
2	Mathematics for CA foundation	B.M.Aggarwal	Kitab Mahal Agencies, Allahabad, Fourth Edition 1998 – 1999

3	Operations Research:Theory and Applications	J.K.Sharma	MacMillan India Ltd, Second Edition, 2003

Skill Development Courses

B.Sc Mathematics

Semester I

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core I Algebra and Calculus	**Course Code: 117M01**
Semester: I	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: 65:10**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C: Contact hours, T:Tutorial)

Course Objectives:

The objectives of introducing this course in the curriculum are

- to impart knowledge about the convergence / divergence criteria of a given series.
- to teach the role of Binomial, Exponential and Logarithmic series and to represent an infinite series in a closed form as the sum of infinite series.
- to develop skills for solving the algebraic equations.
- to expose the various properties of curvature of curves
- to provide a knowledge of various forms of integrals and their applications.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	test the concepts of convergency and divergency of a series.	**U**
CO2	compute the summation of binomial, exponential and logarithmic series.	**U**
CO3	transform and solve algebraic equations with ease.	**A**
CO4	find curvature of curves and distinguish the significance of curvature representation in different co-ordinate systems.	**U**
CO5	evaluate double integrals by changing the order of integration and triple integrals.	**R**
CO6	acquire skill in comprehending and applying the properties of improper integrals.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I	**13 hrs**
Convergency and Divergency of series: Definitions and elementary results – Some general	

theorems concerning infinite series – Series of positive terms – Comparison tests – Cauchy's condensation test – D'Alembert's Ratio test – Cauchy's Root test.

Note : Only Statement of the tests are included.

Book 1: Chapter 2: Sections 8 – 17

Unit II **13 hrs**

Binomial Theorem: Application of the Binomial Theorem to the summation of series. **Exponential and Logarithmic series**: The Exponential Theorem (statement only) – Summation – The Logarithmic series – Modification of the Logarithmic series – Series which can be summed up by the Logarithmic series.

Book 1: Chapter 3: Section 10, Chapter 4: Sections 3, 5, 6, 7 and 9

Unit III **13 hrs**

Theory of Equations: Transformation of Equations – Reciprocal Equation – To increase or decrease the roots of a given equation by a given quantity – Form of the quotient and remainder when a polynomial is divided by a binomial – Removal of terms – Descartes'Rule of signs.

Book 1: Chapter 6: Sections 15 - 19, 24

Unit IV **13 hrs**

Differential Calculus: Envelopes, Curvature of plane curves: Envelopes – Method of finding the envelope – Curvature – Cartesian formula for the radius of curvature – The coordinates of the center of curvature – Evolute and involute – Radius of curvature when the curve is given in polar co-ordinates – p-r equation.

Book 2: Chapter 10: Sections 1.1 - 1.4, 2.1, 2.3 - 2.8

Unit V **13 hrs**

Integral Calculus: Multiple integrals: Definition of the double integral – Evaluation of the double integral – Double integral in polar co-ordinates – Triple integrals. Beta and Gamma functions: Definitions – Convergence of $\Gamma(n)$ – Recurrence formula of Gamma functions – Properties of Beta functions – Relation between Beta and Gamma functions.

Book3: Chapter 5: Sections 1, 2.1, 2.2, 3.1, 3.2, 4 (Problems in 2.2, 3.1, 3.2 and 4)
Chapter 7: Sections 2.1-2.3, 3, 4, 5

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I – III	Algebra Volume I	T. K. Manicavachagom Pillay, T. Natarajan and K. S. Ganapathy,	S.Viswanathan (printers and publishers) Pvt., Ltd., Eleventh Revised Edition, Reprint –2014.
IV	Calculus(Major) Volume I (Differential Calculus)	S.Narayanan and T.K. Manicavachagom Pillay	S.Viswanathan (printers and publishers) Pvt., Ltd.,

			Eighteenth Edition 2012.
V	Calculus(Major) Volume II (Integral Calculus)	S.Narayanan and T.K. Manicavachagom Pillay	S.Viswanathan (printers and publishers) Pvt., Ltd., Eighteenth Revised Edition 2012.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Mathematics for B.Sc Br–I, First Semester, Volume I	P.Kandasamy, K.Thilagavathy	S.Chand & Company Ltd, First Edition, 2004.
2	Differential Calculus	Shanthi Narayanan	Shayambal Charitable Trust, 1987.
3	Integral Calculus	Shanthi Narayanan	S. Chand & Co, 1987.

B.Sc Mathematics

Semester I

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core II Differential Equations and Laplace Transforms	**Course Code: 117M02**
Semester: I	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: 65:10**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C: Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to introduce the concepts involved in solving first order differential equations.
- to provide practice in solving second order differential equations.
- To enable the students to solve simultaneous linear differential equations with constant coefficients.
- to impart concepts regarding partial differential equations and their solutions.
- to introduce Laplace transform of functions and to equip the skill of solving second order differential equation with constant coefficients using Laplace transforms.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	identify the methods of solving first order and higher degree differential equations and apply them.	**R**
CO2	solve the linear differential equations with constant and variable coefficients.	**A**
CO3	derive solution of simultaneous differential equations.	**U**

CO4	solve the first order partial differential equations.	**A**
CO5	know about the Laplace transforms of various functions.	**R**
CO6	apply Laplace transforms to solve differential equations.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I **13 hrs**

Differential Equations: Differential equations of the first order: Equations of the first order, but of higher degree: Equations solvable for dy/dx **–** Equations solvable for y **–** Equations solvable for x (particular cases of 5.2) **–** Clairaut's form **–** Extended form of Clairaut's Equations **–** Equations that do not contain x explicitly–Equations that do not contain y explicity **–** Equations homogeneous in x and y.

Chapter 1: Sections 5.1 - 5.5, 6.1, 6.2, 7.1 - 7.3

Unit II **13 hrs**

Linear Differential Equations with Constant Coefficients: Solving $(d^n y/ dx^n) + a_1(d^{n-1}y/dx^{n-1}) + a_2(d^{n-2}y / dx^{n-2}) +\ldots+ a_n y = X$, when X is of the form $e^{ax}V$, V is any function of x **–** Linear differential equations with variable coefficients **–** Equations reducible to the linear homogeneous equation.

Chapter 2: Sections 4(d), 8, 9

Unit III **13 hrs**

Simultaneous Differential Equations: Simultaneous equations of the first order and first degree **–** Solutions of $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ **–** Methods for solving $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ **–** Simultaneous linear differential equations with constant coefficients.

Chapter 3: Sections 1 - 4, 6

Unit IV **13 hrs**

Partial Differential Equations: Derivation of Partial Differential Equations **–** Different integrals of Partial differential equations (definition only) – Standard types of first order equations **–** Lagrange's equation.

Chapter 4: Sections 1 - 3, 5, 6

Unit V **13 hrs**

The Laplace Transforms: Definition **–** Results from the definition **–** Laplace transforms of periodic functions – Some general Theorems **–** Evaluation of certain integrals using Laplace transforms **–** The inverse transforms **–** Solving second order differential equations with constant coefficients using Laplace transforms.

Chapter 5: Sections 1 – 8

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Calculus(Major) Volume III	S.Narayanan and T.K. Manicavachagom Pillay	S.Viswanathan (printers and publishers) Pvt., Ltd., 2014.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Advanced Engineering Mathematics	Ervin Kreyszig	Wiley Eastern Ltd., 8^{th} edition, 2006
2	Differential Equations with applications and Historical Notes	George .F.Simmons,	McGrawHill,Inc, 2^{nd} Edition 1991.

B.Sc Mathematics

Semester II

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core III Analytical Geometry	**Course Code: 217M03**
Semester: II	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: 65:10**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C: Contact hours, T: Tutorial)

Course Objectives:

The primary objectives of introducing this course are

- to understand the mathematical representation of the geometrical figures.
- to give a training for visualizing ideas in two and three dimensions.
- to give an in-depth knowledge in three dimensional figures to understand graphic concepts.
- to make the students visualize the concepts using GeoGebra.

Course Outcomes: On completion of the course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	represent straight lines, circles and conics using polar co-ordinates	**U**
CO2	apply the concepts of direction ratios and direction cosines in planes and straight lines	**A**
CO3	analyse the concept of straight lines through planes.	**A**
CO4	discuss about the various aspects of sphere and sections of a sphere.	**U**
CO5	identify various types of cone and obtain their equations.	**R**
CO6	use GeoGebra to draw Geometric figures.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I	**13 hrs**
Polar coordinates. Book 1: Chapter 10	

Unit II	**13 hrs**
Planes: First degree equation–Equations of planes – General form of the equation of a plane passing through (x_1, y_1, z_1) – Equations of different planes – Intercept form of equation of a plane – coplanarity of three lines through a point – Loci related to x, y, z intercepts – Equation $P + \lambda P' = 0$. Simple Geometric figures using GeoGebra. Book 2: Chapter 3: Sections 3.1 - 3.5	

Unit III	**13 hrs**
Straight Lines: Equations of a straight line – Equations of the line of intersection of two planes – Conditions for various situations of a line with reference to a plane – Plane through a given line – Coplanarity of two straight lines – Shortest distance between two skew lines – Equations of the common perpendicular – Feet of the common perpendicular. Simple Geometric figures using GeoGebra. Book 2 : Chapter 4: Sections 4.1 - 4.3, 4.6, 4.9 - 4.11	

Unit IV	**13 hrs**
Sphere: Equation of a sphere **–** Standard equation of a sphere – Sphere on a given diameter – Results based on properties of a sphere – Tangent plane to a sphere **–** Loci related to x, y, z intercepts (continued) – Equations of a circle – Centre and radius of a circle – Family of spheres through a circle – Touching spheres – Point of contact of touching spheres. Simple Geometric figures using GeoGebra. Book 2 : Chapter 5: Sections 5.1 - 5.5.2	

Unit V	**13 hrs**
Cone and Cylinder: Cone – Right Circular cone – Equation of a general cone – Surface represented by a homogeneous equation **–** Equation obtained by homogenizing – Nature of a Quadric cone with vertex at the origin – Intersection of a cone by a plane through the vertex – General second degree cone. Simple Geometric figures using GeoGebra. Book 2 : Chapter 6: Sections 6.1 - 6.5	

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I	Analytical Geometry (2–D)	P.Duraipandian, Kayalal Pachaiyappa	Muhil Publishers, 2010.
II-V	Analytical Geometry (3–D)	P.Duraipandian, Kayalal Pachaiyappa	Muhil Publishers, 2009.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	A text book of Analytical Geometry (Part I–Two Dimensions)	T.K.Manickavasagam Pillai, T.Natarajan	S.Viswanathan (printers and publishers), Pvt., Ltd., 8th edition, 2010.
2	Analytical Geometry (Three Dimensional)	T.K.Manickavasagam Pillai, T.Natarajan	Viswanathan Publications, 2010

B.Sc Mathematics

Semester II

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core IV Numerical Methods	**Course Code: 217M04**
Semester: II	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: 65:10**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C: Contact hours, T:Tutorial)

Course Objectives:

Objectives of introducing this course are

- to introduce various numerical methods of solving Numerical, Algebraic and Transcendental equations.
- to introduce interpolation techniques and their applications to real life situations.
- to provide knowledge to the students about the quadrature formulae and their applications.
- to apply numerical differentiation and numerical integration appropriately.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	solve algebraic, transcendental and system of equations by Direct and Iterative methods.	**A**
CO2	illustrate the use of different types of difference operators	**U**
CO3	identify unknown values using available data.	**U**
CO4	solve physical problems using different types of operators.	**A**
CO5	find the derivatives of functions using various interpolation methods.	**U**
CO6	perform integration of functions using numerical techniques.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I	**13 hrs**
The solution of Numerical, Algebraic and Transcendental Equations: The Bisection method – Regula-Falsi method – Newton-Raphson method. Solution of Simultaneous Linear	

Algebraic Equations: Introduction – Gauss-Elimination Method – Gauss-Jordan elimination method – Iterative methods – Gauss-Jacobi method – Gauss-Seidel method of iteration.
Chapter 3: Sections 3.1.1, 3.3, 3.4 Chapter 4: Sections 4.1, 4.2, 4.2.1, 4.7 - 4.9

Unit II **13 hrs**

Finite Differences: First difference – Express any value of y in term of y_n and the backward differences of y_n – Differences of a polynomial – Factorial polynomial – Error propagation in a difference table. **Interpolation(for Equal Intervals)**: Introduction – Linear Interpolation or method of proportional parts – Gregory-Newton forward Interpolation formula – Gregory-Newton backward Interpolation Formula.
Chapter 5: Sections 5.1 - 5.5, Chapter 6: Sections 6.1 - 6.3

Unit III **13 hrs**

Central Difference Interpolation formulae (For Equal Intervals): Central differences and central difference table – Central difference interpolation formula – Gauss's forward Interpolation formula – Gauss's backward interpolation formula – Stirling's formula – Bessel's formula.
Chapter 7: Sections 7.1 - 7.6

Unit IV **13 hrs**

Interpolation with Unequal Intervals: Introduction – Divided differences – Properties of divided differences – Relation between divided differences and forward differences – Theorem: Newton's interpolation formula for unequal intervals – Deduction: Deduce Gregory Newton interpolation forward formula for equal intervals – Lagrange's interpolation formula (for unequal intervals).
Chapter 8: Sections 8.1 - 8.7

Unit V **13 hrs**

Numerical differentiation and Integration: Introduction – Newton's forward difference formula to get the derivative – Newton's backward difference formula to compute the derivative – Derivative using Stirling's formula – Caution – To find maxima and minima of the function given the tabular values. **Numerical Integration**: Introduction – A general Quadrature formula for equidistant ordinates – Trapezoidal rule – Simpson's one-third rule – Simpson's three-eighths rule.
Chapter 9: Sections 9.1 - 9.9, 9.13 and 9.14

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Numerical Methods	Dr.P.Kandasamy,	S. Chand & Company limited,

		Dr. K.Thilagavathy and Dr. K.Gunavathi,	Third Revised Edition Reprint (2016).

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Numerical Methods in Science and Engineering	Dr.M.K.Venkataraman	National Publishing Company, fifth edition, 1995.
2	Finite differences and Numerical Analysis	H.C.Saxena	S. Chand & Company limited, New Delhi, 2001.

B.Sc Mathematics

Semester III

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part IV - Skill Enhancement Course I : Graph Theory-I	**Course Code: 317MS1**
Semester: III	**No. of Credits: 2**
No. of hours :45 (Total hours)	**C:T: 39 : 6**
CIA Max. Marks: 75	**ESE Max. Marks: -**

(C: Contact hours, T: Tutorial)

Course Objectives:

Objectives of this course are

- to enable the students to learn the basic concepts of graph theory.
- to introduce various types of graphs.
- to have a deep understanding of digraphs and their properties.
- to be familiar with the different ways of representing graphs and digraphs.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	understand the basic concepts in graph theory.	**U**
CO2	find the degree sequence, connectivity and isomorphism of graphs.	**U**
CO3	identify Hamiltonian and Eulerian graphs.	**R**
CO4	gain knowledge about directed graphs.	**R**
CO5	write adjacency and incidence matrix of a given labeled graph or digraph and vice versa.	**A**
CO6	determine the number of walks between given vertices and the nature of the graphs	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I	**8 hrs**
Graphs: Graphs and Sub graphs – Vertex Degrees – Paths and Cycles. Chapter 2: Sections 2.1 - 2.3	

Unit II	**8 hrs**
Graphs: Regular and bipartite graphs. **Eulerian and Hamiltonian Graphs**: Exploring and Travelling. Chapter 2: Sections 2.4, Chapter 3: Sections 3.1	

Unit III	**8 hrs**
Eulerian and Hamiltonian Graphs: Eulerian Graphs **–** Hamiltonian Graphs. Chapter 3: Sections 3.2 and 3.3	

Unit IV	**7 hrs**
Digraphs: Digraphs and Sub digraphs **–** Vertex Degrees **–** Paths and Cycles. Chapter 4: Sections 4.1 - 4.3	

Unit V	**8 hrs**
Matrix Representations: Adjacency Matrices **–** Walks in graphs and Digraphs **–** Incidence Matrices. Chapter 5: Sections 5.1- 5.3	

Note: Proof of the theorems are not included

Book for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I-V	Graphs and Applications – An Introductory Approach	Joan M.Aldous and Robin J.Wilson	Springer - Second Indian Reprint 2014.

Books for Reference:

S.No.	**Name of the Book**	**Authors**	**Publishers with Edition**
1	Graph Theory	Frank Harary	Narosa Publishing House, New Delhi, Tenth Reprint 2001.
2	A First Look at Graph Theory	John Clark, Derek Allan Holton	Allied Publishers Ltd,Reprint 1995.
3	Graph Theory with Applications to Engineering and Computer Science	Narsingh Deo	Prentice – Hall of India Private Ltd, New Delhi 2005.
4	Graphs,Networks and Algorithms	Dieter Jungnickel	Springer – Verlag Berlin Heidelberg, 2005.

Semester IV

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Allied IV Mathematical Statistics	**Course Code: 417AM5**
Semester: IV	**No. of Credits: 4**
No. of hours :90 (Total hours)	**C:T: 75:15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to provide knowledge about random variables and their different distributions.
- to comprehend the characteristics of distributions.
- to create awareness of the sampling distributions and their applications.
- to take up research

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	explain the concepts of random variable, probability distribution, distribution function, expected value, variance and higher moments, and calculate expected values and probabilities associated with the distributions of random variables	**U**
CO2	compute moments and moment generating functions of various distributions.	**U**
CO3	identify the relationship between attributes	**R**
CO4	describe Normal, uniform, Gamma, beta ,t, F and chi-square distributions.	**R**
CO5	apply sampling distributions in real world problems	**A**
CO6	evaluate expectation and variance	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**15 hrs**
Random variables: Function of a random variable – Two dimensional random variable – Definitions – Marginal probability distribution – Conditional probability distribution – Independent random variable. Chapter 2: Pages 2.13 - 2.35	

Unit II	**15 hrs**
Variance: Tchebechev's Inequality. **Moments and Moment Generating Function. Conditional Expectation.** Chapter 4: Pages 4.21 - 4.26, Chapter 5 and Chapter 7	

Unit III	**15 hrs**
Correlation. Chapter 8: Pages 8.1 - 8.61	

Unit IV	**15 hrs**
Normal Distribution. Uniform Distribution. Exponential Distribution. Gamma Distribution. Beta Distribution. Chapters: 16, 17, 18, 19, 20	

Unit V	**15 hrs**
Sampling Distribution – Chi Square, t, F Distributions. Chapter 22.	

Book for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I - V	Mathematical Statistics	P.R. Vittal	Margham Publications, First Edition, 2010

Books for Reference:

S.No	**Name of the Book**	**Authors**	**Publishers with Edition**
1	Fundamentals of Mathematical statistics	S.C. Gupta and V.K.Kapoor	Sultan Chand & Company, Eleventh Edition, 2002
2	Introduction to Mathematical statistics	Robert V.Hogg & Allen T. Craig	Fifth Edition, Pearson Education

B.Sc Mathematics

Semester IV

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part IV - Skill Enhancement Course II Graph Theory II	**Course Code: 417MS2**
Semester: IV	**No. of Credits: 3**
No. of hours :45 (Total hours)	**C:T: 39:6**
CIA Max. Marks: 75	**ESE Max. Marks: -**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to expose mathematical properties of trees and its applications.
- to introduce Prufer sequence, Cayley's theorem to count the number of trees
- to solve minimum connector problem and traveling salesman problem
- to provide some methods for analyzing the real world problems involving shortest distances.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	label different types of trees and its properties	**R**
CO2	obtain the Prufer sequence associated with the given tree and vice versa	**A**
CO3	understand the method for counting binary trees	**U**
CO4	find the upper bounds for the solution to travelling salesman problem	**A**
CO5	use Fleury's algorithm to find Eulerian trail and Shortest path algorithm to find shortest path	**A**
CO6	determine edge connectivity, vertex connectivity and cutsets of a graph	**U**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I	**8 hrs**
Tree Structures: Mathematical Properties of Trees – Spanning Trees – Rooted Trees. Chapter 6: Sections 6.1 - 6.3	

Unit II	**8 hrs**
Counting Trees: Counting Labeled Trees – Counting Binary Trees. Chapter 7: Sections 7.1 and 7.2	

Unit III	**7 hrs**
Greedy Algorithms: Minimum Connector Problem – Travelling Salesman Problem. Chapter 8: Sections 8.1 and 8.2	

Unit IV	**8 hrs**
Path Algorithms: Fleury's Algorithm – Shortest Path Algorithm. Chapter 9: Sections 9.1 and 9.2	

Unit V	**8 hrs**
Paths and Connectivity: Connected Graphs and Digraphs – Menger's Theorem for Graphs – Some analogues of Menger's theorem. Chapter 10: Sections 10.1 - 10.3	

Note: Proof of the theorems are not included

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Graphs and Applications - An	Joan M.Aldous and	Springer - Second Indian

	Introductory Approach	Robin J.Wilson	Reprint 2014.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Graph Theory	Frank Harary	Narosa Publishing House, New Delhi, Tenth Reprint 2001.
2	A First Look at Graph Theory	John Clark, Derek Allan Holton	Allied Publishers Ltd,Reprint 1995.
3	Graph Theory with Applications to Engineering and Computer Science	Narsingh Deo	Prentice – Hall of India Private Ltd, New Delhi 2005.
4	Graphs,Networks and Algorithms	Dieter Jungnickel	Springer – Verlag Berlin Heidelberg, 2005.

B.Sc Mathematics

Semester V

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Core XII Group Project	**Course Code: 517M12**
Semester: V	**No. of Credits: 4**
No. of hours :75 (Total hours)	**P:T:65:10**
CIA Max. Marks: 50	**ESE Max. Marks: 50**

(P:Project hours, T:Tutorial)

Preamble:

This course is offered with an intention of promoting knowledge sharing and team work. It enables the students to communicate and share their expertise to enhance their Skills. Students are motivated to take up interdisciplinary projects to learn and analyse the application of mathematics in various disciplines like Physics, Chemistry, Biosciences and Social sciences.

Course Objectives: Objectives of this course are

- to develop teamwork.
- to enhance communicative capabilities.
- to provide foundation for creativity and research.
- to manage a given task efficiently in the stipulated time.

Course Outcomes: On completion of the course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	collaborate and cooperate among themselves to execute the task.	**U**
CO2	develop communication and teamwork skills.	**R**
CO3	pool their expertise, knowledge and skills and complete the tasks.	**A**
CO4	effectively manage time, execute the plan and integrate various activities	**A**

CO5	break down a complex problem into simple components and determine solutions for the same.	**A**
CO6	prepare and present the report of the project in an organized manner.	**A**

B.Sc Mathematics

Semester V

(For the students admitted during the academic year 2018 – 2019 and onwards)

Course: Part III –Elective I Programming in C(T & P)	**Course Code: 518ME1**
Semester: V	**No. of Credits: 4**
No. of hours : 90 (Total hours)	**C:T: P: 52:12:26**
CIA Max. Marks: 15	**ESE Max. Marks: 35**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to introduce the basics of programming.
- to improve the logical thinking.
- to imbibe confidence and skill to develop programs for solving problems in mathematical, physical and social sciences.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	recognize and recall different data types, operators and input output operations using the 'C' Language	**R**
CO2	make a comprehensive use of operators in various situations.	**U**
CO3	design programs involving decision based structures	**A**
CO4	explain the concept of Arrays and functions and their uses..	**U**
CO5	handle structures and union in the context of mathematical, physical or general problems .	**A**
CO6	demonstrate skill in applying the various tools of the language to develop programs independently.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**11 hrs**

Constants, Variables and Data types: Introduction – Character set – C tokens – Keywords and Identifiers – Constants – Variables – Data types – Declaration of variables – Declaration of storage class – Assigning values to variables – Defining symbolic constants – Declaring a variable as constant – Declaring a variable as Volatile.

Operators and Expressions: Introduction – Arithmetic operators – Relational operators – Logical operators – Assignment operators– Increment and decrement operators – Conditional operator – Bitwise operators – Special operators – Arithmetic expressions – Evaluation of expressions – Precedence of Arithmetic operators – Some computational

problems – Type conversions in expressions – Operator precedence and associativity – Mathematical functions.
Chapter 2: Sections 2.1 - 2.13, Chapter 3

Unit II **10 hrs**

Managing Input and Output operations: Introduction – Reading a Character – Writing a Character – Formatted Input – Formatted Output. **Decision making and Branching:** Introduction – Decision making with IF statement – Simple IF statement – The IF…ELSE statement – Nesting of IF…ELSE statements – The ELSE IF ladder – The Switch statement – The ?: operator – The GOTO statement.
Chapter 4 and Chapter 5

Unit III **10 hrs**

Decision making and looping: Introduction – The WHILE statement – The DO statement – The FOR statement – Jumps in loops. **Arrays:** Introduction – One-dimensional Arrays **–** Declaration of One-dimensional Arrays – Initialization of One-dimensional Arrays – Two-dimensional Arrays – Initializing Two-dimensional Arrays – Multi-dimensional Arrays.
Chapter 6: Sections 6.1- 6.5, Chapter 7: Sections 7.1 - 7.7

Unit IV **11 hrs**

Character arrays and strings: Introduction – Declaring and initializing string variables – Reading strings from terminal – Writing strings to screen – Arithmetic operations on characters – Putting strings together – Comparison of two strings – String handling functions. **User-Defined functions :** Introduction – Need for user defined functions – A multi– function program – Elements of user defined functions – Definition 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 – Arguments with return values – No arguments but returns a value – Functions that return multiple values.
Chapter 8: Sections 8.1 - 8.8, Chapter 9: Sections 9.1 - 9.14

Unit V **10 hrs**

User-Defined functions: Nesting of functions – Recursion – Passing arrays to functions – Passing strings to functions – The scope, visibility and lifetime of variables. **Structures andUnions:** Introduction – Defining a Structure – Declaring Structure variables – Accessing Structure members – Structure Initialization – Copying and Comparing Structure variables – Operations on Individual members – Arrays of Structures – Arrays within Structures – Structures within Structures – Structures and Functions – Unions.
Chapter 9: Sections 9.15 - 9.19, Chapter 10: Sections 10.1 - 10.12

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I –V	Programming in ANSI 'C'	E.Balagurusamy	Tata McGraw Hill Education Private Limited, Seventh Edition 2017.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	The Complete Reference	Herbert Schilde	Tata McGraw-Hill, Fourth Edition Reprint 2010.
2	Programming in C	Ashok N Kamthane and Amit Ashok Kamthane	Pearson India Education Services Private Limited, Third Edition 2016

Syllabus:

Programming in C – List of Programs	**26 hrs**

1. Determine sum, average, standard deviation for a given set of numbers.
2. Generate Fibonacci series.
3. Prime number checking.
4. Finding roots of a Quadratic Equation.
5. Find the product of two matrices.
6. Find the factorial of a number using recursion.
7. Check whether a string is PALINDROME or not.
8. Arrange strings in alphabetical order.
9. Count tabs, number of lines, characters and blank spaces in a given text.
10. Read and Print personal information using structures.
11. Determine the roots of an algebraic/transcendental equation using Newton Raphson method
12. Evaluate an integral using Simpson's one-third rule.

B.Sc Mathematics

Semester V

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III – Elective I Number Theory	**Course Code: 517ME2**
Semester: V	**No. of Credits: 4**
No. of hours :90 (Total hours)	**C:T: 75:15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to impart the basic knowledge about number theoretic concepts.
- to improve problem solving ability related to number theory.
- To enable the students to construct mathematical proofs and to provide counter examples.
- to make students familiar with basic properties and techniques of finite fields and their application to cryptography and coding theory.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	know about the basic concepts of numbers.	**R**

CO2	understand the origin of the operations of integers and algorithms relevant to it.	**U**
CO3	identify all prime numbers in a given range using the sieve of Eratosthenes.	**R**
CO4	solve congruences	**A**
CO5	test primitive roots.	**A**
CO6	apply number theory in cryptography.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**15 hrs**
Natural Numbers : Peano's axioms – Mathematical induction – Addition and Multiplication – order relation – Principle of well ordering. **Integers :** Addition and Multiplication – Positive and Negative integers – Trichotomy law – Absolute value – Binomial Theorem. **Divisibility :** Associates – Division Algorithm – GCD (HCF) – Euclidean Algorithm – L.C.M.- Worked Examples Chapters 1, 2, 3	

Unit II	**15 hrs**
Prime and Composite Numbers : Sieve of Eratosthenes – Euclid's Theorem – Unique factorization – Fundamental theorem of Arithmetic – Postional representation of integers – number of divisors – Sum of divisors – Symbols d(n), $\sigma(n)$ – Arithmetic functions – Perfect Numbers. Related Problems in Examples 7 and 8. Chapter 4: Pages 61 - 84	

Unit III	**15 hrs**
Congruences : Definition – Residue classes – Complete and least residue systems – Reduced residue systems – Casting out 9 – Magic Numbers – Divisibility tests – Linear Congruences – Solution of Congruences – Chinese Remainder Theorem. Related Problems in Examples 15 - 19. Chapter 6	

Unit IV	**15 hrs**
Theorems of Fermat and Wilson : Little's Fermat's Theorem – Euler's extension – inverse modulo – Wilson's Theorem and its converse. Related Problems in Examples 20 -22. Chapter 7: Pages 208 - 235	

Unit V	**15 hrs**
Primitive Roots : Exponent of an integer – Primitive roots – Number of Primitive roots – 1, 2, 4, p^{α}, $2p^{\alpha}$ alone have primitive roots – Test for primitive roots – Legendre theorem. Related Problems in Examples 26 and 27.	

Chapter 9: Pages 274 - 303

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I -V	Elements of Number Theory	Kumaravelu and Susheela Kumaravelu	First Edition January 2002

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1.	Elementary Number Theory	David M.Burton	McGraw Hill Education (India) Private Limited, Seventh Edition Eleventh reprint, 2015.
2.	An Introduction to Theory of Numbers	Ivan Niven and Herbert S. Zuckerman	Wiley Eastern Ltd, Fifth Edition, 2004 Reprint.

B.Sc Mathematics

Semester V

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part IV – Skill Enhancement Course III SCILAB	**Course Code: 517MS3**
Semester: V	**No. of Credits: 3**
No. of hours : 45 (Total hours)	**T:P:6:39**
CIA Max. Marks: 75	**ESE Max. Marks:-**

(T:Tutorial, P:Practical)

Course Objectives:

The objective of this course is to

- develop the logical and programming skills.
- provide hands on training in executing programs.
- gain skills to implement the algorithms.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	describe the basic features of the SCILAB software.	**R**
CO2	use basic structures to develop code in SCILAB to handle arrays and perform mathematical operations.	**U**
CO3	demonstrate appropriate use of graphical functions	**U**
CO4	apply the concept of structures and functions in establishing databases/ simple banking operations.	**A**
CO5	interpret and visualize application of mathematical concepts in application processing and numeric manipulations.	**A**
CO6	apply the working knowledge of SCILAB package to solve	**A**

	ODE's and LPP's.	

R-Remembrance U –Understanding A-Apply

Syllabus:

Scilab – List of Programs	**39hrs**

1.Solving a system of linear Equations.
2.Arithmetic operations on arrays.
3.Drawing 2D and 3D plots.
4.Finding derivatives and integrals of polynomials.
5.Creating a structure for an employee data base containing employee code, name, designation and salary.
6.A function subprogram to calculate the compound interest, given the initial amount, time period of deposit, rate of interest and time of compounding.
7.Program to process the applications for admission to an engineering college and to list the candidates eligible for admission based on the following conditions:
   (a) Marks in Mathematics ≥ 60
   (b) Marks in Physics ≥ 55
   (c) Marks in Chemistry ≥ 55
   (d) Total marks ≥ 180
8.Program to reverse the digits of a number having minimum three digits.
9.Program to solve first order Ordinary Differential Equations (ODE's).
10. Solving Linear Programming Problem (LPP).

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1.	Programming in Scilab	Vinu Dass	New Age International Private Ltd, New Delhi 2009

B.Sc Mathematics

Semester VI

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part IV-Skill Enhancement Course IV Internship / Summer Training	**Course Code: 617MS4**
Semester: VI	**No. of Credits: 3**
No. of hours : 45(Total hours)	**I:T:R: 30:6:9**
CIA Max. Marks: 75	

(I :IntershipTraining, T: Tutorial, R: Report)

Preamble:

Internship is intended to provide a proactive industry/ Subject oriented exposure at institutes of repute to the students so as to smoothly enter into a profession of their choice on completing their graduation. In this course students are expected to undergo intensive training in institutions for 30 hours, with a certification from the institute. It is followed by discussion with

the faculty or other experts to prepare the reports. The reports are prepared and submitted for evaluation.

Course Objectives:

The objectives of this course are to

- enable the students to seek career alternatives before graduation.
- integrate theory and practice.
- realize their abilities in their field of study.
- inculcate work ethics and appropriate attitudes needed for a profession.
- improve communication, interpersonal and other professional skills.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	learn to use profession specific terminology.	**R**
CO2	effectively plan and utilize ICT tools to complete the task.	**U**
CO3	apply the knowledge acquired in the campus to the task.	**A**
CO4	demonstrate problem-solving and critical thinking skills.	**A**
CO5	exhibit appropriate workplace attitudes	**A**
CO6	manage and review their personal behavior and attitudes.	**U**

B.Sc Computer Science / BCA

Semester I

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Allied I Basic Mathematics and Statistics	**Course Code: 117AS1/117AK1**
Semester: I	**No. of Credits: 4**
No. of hours: 90 (Total hours)	**C:T: 75 : 15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to teach various numerical methods of solving system of equations.
- to introduce various interpolation techniques and their applications to real life situations.
- to give them a knowledge about the quadrature formulae and their applications.
- to practice various statistical techniques with reference to applications.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	solve a linear system of equations by direct and iterative methods	**A**
CO2	find derivatives of functions using various interpolation methods	**A**
CO3	integrate functions using numerical techniques	**U**
CO4	relate two attributes	**R**
CO5	know about the characteristics of normal distribution	**R**
CO6	compute regression equations	**U**

R-Remembrance U-Understanding A-Apply

Syllabus:

Unit I:	**15 hrs**

Numerical Methods: Solution of simultaneous linear algebraic equations (Direct method): Introduction – Gauss-Elimination method (Direct method) – Gauss-Jordan elimination method (Direct method) – Inversion of a matrix using Gauss-Elimination method – Iterative methods – Jacobi method of iteration or Gauss-Jacobi method – Gauss-seidal method of iteration.

Book 1: Chapter 4: Sections 4.1 - 4.3, 4.7 - 4.9

Unit II	**15 hrs**

Interpolation (For Equal Intervals): Gregory-Newton forward interpolation formula or Newton's forward interpolation formula (for equal intervals) – Gregory-Newton backward interpolation formula (for equal intervals). **Numerical Differentiation and Integration:** Introduction – Newton's forward difference formula to get the derivative – Newton's backward difference formula to compute the derivative – Derivative using Stirling's formula.

Book 1: Chapter 6: Sections 6.2, 6.3, Chapter 9: Sections 9.1 - 9.4

Unit III	**15 hrs**

Numerical Integration: Introduction – A general quadrature formula for equidistant ordinates (or Newton-Cote's formula) – Trapezoidal rule – Simpson's one-third rule – Simpson's three-eighths rule. **Numerical solution of ordinary differential equations**: Solution by Taylor series (Type I) – Runge-Kutta method – Second Order Runge-Kutta method (for first order O.D.E).

Book 1: Chapter 9: Sections 9.7 - 9.9, 9.13, 9.14, Chapter 11: Sections 11.5, 11.12, 11.13

Unit IV	**15 hrs**

Correlation analysis: Introduction – Significance of the study of correlation – Correlation and Causation – Types of correlation – Methods of studying correlation – Graphic method – Karl pearson's Coefficient of Correlation – Coefficient of correlation and Probable error –

Coefficient of Determination – Properties of the coefficient of correlation – **Rank Correlation coefficient:** Features of Spearman's correlation coefficient – Merits and limitations of the Rank method.

Book 2: Volume I: Chapter 10: Pages 389 - 424

Unit V **15 hrs**

Regression Analysis: Introduction – Uses of Regression analysis – Difference between correlation and Regression analysis – Regression lines – Regression equations – Regression equations in case of correlation table. **Theoretical Distributions:** Introduction – Normal distribution.

Book 2: Volume I : Chapter 11: Pages 451 - 469

Volume II : Chapter 2: Pages 805 - 808, 836 - 858

Note: Derivations are not included.

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I - III	Numerical methods	P. Kandasamy, K. Thilagavathy and K. Gunavathy	S. Chand & Co(Ltd), Reprint - 2010
IV, V	Statistical methods	S.P.Gupta	S.Chand and Sons Forty Fourth revised edition, 2014.

Books for Reference:

S. No	Name of the Book	Authors	Publishers with Edition
1	Introduction to Business Mathematics	V.Sundaresan and S.D. Jayaseelan	S.Chand and Company, 1997.
2	Statistics	R.S.N. Pillai and V.Bagavathy	S.Chand and company, 1995
3	Introductory Methods of Numerical Analysis	S.S.Sastry	Prentice Hall of India Pvt, Ltd., Fourth Edition 2008.

B.Sc Statistics

Semester I

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Allied I Mathematics For Statistics I	**Course Code: 117AW1**
Semester: I	**No. of Credits: 4**
No. of hours :90 (Total hours)	**C:T: 75 : 15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to know the basic concepts of set theory and learn to solve various types of problems in set theory.

- to enumerate the concepts of matrices and determinants.
- demonstrate ability to manipulate the matrices.
- derive statistical formulae using differentiation

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	know the basic operations on sets	**R**
CO2	classify the types of matrices.	**U**
CO3	solve linear equations by using determinants.	**A**
CO4	check the consistency of a linear system of equations.	**A**
CO5	compute the derivatives of functions.	**U**
CO6	compute successive derivatives	**U**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**15 hrs**
Set theory: Definition, Notations – Methods of Description sets – Kinds or Types of sets – Venn Diagram – Set operations – Laws and properties of sets – Number of elements. Part I: Pages 104 - 136	

Unit II	**15 hrs**
Matrices, Determinants, Input – Output Analysis: Definition of a Matrix – Order of a Matrix – Types of Matrices – Matrix operations-I – A system of Linear equations. Part I: Pages 147 - 164	

Unit III	**15 hrs**
Matrices, Determinants, Input-Output Analysis: Determinants – Matrix operations II – Rank of a Matrix – Consistency of system of simultaneous Linear equations – Miscellaneous Illustrations. Part I : Pages 164 - 200	

Unit IV	**15 hrs**
Differentiation: Derivatives of standard functions from first principle – Rules of differentiations – Function of a function rule or chain rule. Part I: Pages 247 - 266	

Unit V	**15 hrs**
Differentiation: Differentiation of implicit functions – Parametric form – value of a derivative at specified values of x – Successive differentiation. Part I: Pages 267 - 280	

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I - V	Business Mathematics and Statistics	PA. Navnitham	Jai Publishers, Latest edition

Books for Reference:

S. No	Name of the Book	Authors	Publishers with Edition
1	Matrices	A.R. VASISHTA	Krishna Prakashan Mandir (P) Ltd., Meerut.
2	Mathematics for CA foundation	B.M. Aggarwal	Kitab Mahal Agencies, Allahabad, Fourth Edition 1998 – 1999.

B.Sc Statistics

Semester II

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Allied II Mathematics for Statistics II	**Course Code: 217AW2**
Semester: II	**No. of Credits: 4**
No. of hours :90 (Total hours)	**C:T: 75 : 15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to solve differential equations and is used extensively in electrical engineering
- to apply Fourier concepts in the field of impage processing
- to acquire knowledge about the convergence and divergence concepts of the given series
- to get familiar with the applications of binomial, exponential and logarithmic expansion for finding the sum of an infinite series.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	evaluate integrals.	**A**
CO2	know about Laplace transform of various functions .	**R**
CO3	obtain Fourier series of various functions.	**U**
CO4	test the concepts of convergency and divergency of series.	**U**
CO5	compute the summation of binomial, exponential and logarithmic series.	**U**
CO6	derive mathematical formulas using various mathematical techniques.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**15 hrs**
Integration : Indefinite integrals – standard forms – determination of c – Definite integrals – Method of substitution – Method of partial fractions – Method of Integration by parts. Book 1: Pages 303 - 318	

Unit II	**15 hrs**
The Laplace Transforms: Definition – Results from the definition – Laplace transforms of periodic functions – Some general theorems – Evaluation of certain integrals using Laplace transforms. Book 2: Chapter 5: Sections 1 - 5	

Unit III	**15 hrs**
Fourier Series: Fourier Series – Even and Odd functions – Half range Fourier series – Development in cosine and sine series. Book 2: Chapter 6: Sections 1 - 5	

Unit IV	**15 hrs**
Convergency and Divergency of series: Definitions and elementary results – Some general theorems concerning infinite series – Series of positive terms – Comparison tests – Convergence and Divergence of series – Cauchy's condensation test – D'Alembert's ratio test – Cauchy's root test. Book 3: Chapter 2: Sections 8 - 17	

Note : Only Statement of the tests are included.

Unit V	**15 hrs**
Binomial Theorem: Binomial Theorem (statement only) – Application of the Binomial Theorem to the summation of series. **Exponential and Logarithmic series**: The Exponential Theorem (statement only) – Summation – The Logarithmic series – Modification of the Logarithmic series – Series which can be summed up by the Logarithmic series. Book 3: Chapter 3: Sections 1 and 10, Chapter 4: Sections 2, 3, 5, 6, 7 and 9	

Books for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I	Business Mathematics and statistics	PA.Navanitham	Jai publishers, Latest edition.
II, III	Calculus (Major) Volume III	S.Narayanan and T.K.Manicavachagom Pillay	S.Viswanathan (Printers and Publishers) Pvt. Ltd, Reprint 2012.
IV, V	Algebra Volume I	T. K.Manicavachagam	S.Viswanathan (printers and

		Pillay, T. Natarajan and K. S. Ganapathy	publishers) Pvt. Ltd, Eleventh Revised Edition, Reprint - 2009.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Mathematics for B.Sc Br–I, First Semester, Volume I	P.Kandasamy, K.Thilagavathy,	S.Chand & Company Ltd, First Edition, 2004
2	Differential Equations with Applications and Historical notes	George. F.Simmons	Mc Graw Hill, Inc,2nd edition 1991
3	Integral Calculus	Shanthi Narayanan	S. Chand & Co, 1987

B.Sc. Physics and Chemistry

Semester III

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Allied III Mathematics I	**Course Code: 317AP3/317AC3**
Semester: III	**No. of Credits: 4**
No. of hours :90 (Total hours)	**C:T : 75:15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to become familiar with applications of Binominal, Exponential and Logarithmic expansions for finding the sum of series.
- to acquire knowledge on solving reciprocal equations and finding the roots by Newton Raphson method.
- to be familiar with the knowledge of eigen values and eigen vectors.
- to enable the students to understand the concepts of interpolation.
- to learn about trigonometric concepts

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	find the sum of binomial, exponential and logarithmic series	**U**
CO2	understand the basic concepts of theory of equations.	**U**
CO3	gain knowledge of real life applications of matrices.	**R**
CO4	understand how interpolation technique is applied in real life	**A**
CO5	know about the properties of trigonometric functions and their applications	**R**
CO6	explain the fundamentals of the mathematics and apply while creating innovations	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**16 hrs**

Algebra:

The Binomial Theorem: Theorem – Some Standard Expansions – The General Term – Summation of series. **Exponential theorem** – The number e – The Exponential Theorem (without Proof) – Some useful results – Summation of series. **The Logarithmic series**: Theorem–Some Standard Results – Summation of series

(Approximation Problems are Excluded)

Chapters II, III and IV.

Unit II	**16 hrs**

Theory of Equations: To diminish the roots of an equation by h. Reciprocal equations. Newton's Method of Successive Approximations.

Chapters I(Ex - 3), II and III

Unit III	**15 hrs**

Matrices:

Fundamental Concepts :Introduction-Special types of matrices-Matrices associated with a given matrix-operations-Matrix multiplication-Properties of matrix multiplication-Associated matrices-Adjoint of a square matrix-Inverse of a matrix. **Characteristic Roots and Characteristic Vectors**: Linear transformation-The characteristics equation of a transformation-Properties of the eigen vectors-Cayley Hamilton theorem.

Chapters I and IV

Unit IV	**16 hrs**

Finite Differences:

Finite Differences. Interpolation: Newton's Forward, Backward Interpolation.

Chapters I, II

Unit V	**15 hrs**

Trigonometry:

Expansion in Series. Exponential Series and Hyperbolic functions.

Chapters I and II

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Allied Mathematics Volume I	P.Kandasamy, K.Thilagavathy	S. Chand and Company Limited, First Edition, Reprint 2014.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1.	AText book of Modern Algebra	R.Balakrishnan and M.Ramabhadran	Vikas Publishing House, Pvt Ltd. 3rd Edition 1979
2.	Numerical Methods	P.Kandasamy, K.Thilagavathy & K. Gunavathi	S.Chand and company Limited 2010.

B.Sc. Physics and Chemistry

Semester IV

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Allied IV Mathematics II	**Course Code: 417AP4/417AC4**
Semester: IV	**No. of Credits: 4**
No. of hours :90 (Total hours)	**C:T: 75:15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to analyze the various properties of curves using methods of calculus.
- to introduce different methods of solving ordinary and partial differential equations.
- to expose to the students the Laplace Transforms, its properties and its applications in physical and chemical sciences.
- to introduce the Fourier series and its various forms.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	understand the basic concepts of calculus.	**U**
CO2	find curvature of curves and distinguish the significance of curvature representation in different co-ordinate systems.	**U**
CO3	find the solution of higher order differential equations.	**A**
CO4	know about various methods of solving Partial differential equations.	**R**
CO5	acquire knowledge about the Laplace transforms and its inverse.	**R**
CO6	obtain the Fourier series for various function.	**A**

R-Remembrance U –Understanding A-Apply

Syllabus:

Unit I:	**16 hrs**
Calculus and Differential Geometry: **Curvature**: Some important results – Radius of curvature in Cartesians – Centre and circle	

of curvature – Radius of Curvature in Polar Coordinates.

Evolutes, Involutes and Envelops: Evolutes and Involutes – Method to find the evolute of a given curve $y = f(x)$

Book 1 : Chapter 2, Chapter 3: Pages 345 - 351

Unit II **16 hrs**

Ordinary Differential Equation: Linear equations of second and higher order.

Book 2 : Chapter 2

Unit III **15 hrs**

Partial Differential Equation:

Partial Differential Equations: Introduction – Formation of differential equations – By the elimination of arbitrary constants – By the elimination of arbitrary functions – Solution of partial differential equations – To find the singular integral – To find the general integral – Methods to solve the first order partial differential equations – Type I. $F(p, q) = 0$ – Type II. Clairaut's Form. $z = px + qy + f(p, q)$ – Type III. $F(z, p, q) = 0$, $F(x, p, q) = 0$, $F(y, p, q) = 0$ – Lagrange's linear equation – Solution of the subsidiary equation by the method of multipliers.

Book 2: Chapter 1: Sections 1.1 - 1.7, 1.9 - 1.12, 1.15, 1.16

Unit IV **16 hrs**

Laplace Transform:

Laplace Transforms: Definition – Laplace Transform of standard functions – Theorems (Statements only) –Inverse Laplace transforms – Problems.

Book 2: Chapter 1 (Related to the above topics): Pages 187 – 225

Unit V **15 hrs**

Fourier Series and its Applications:

Fourier Series – Even and Odd functions – Half range series – Half range sine series – Half range Cosine series.

Book 3: Chapter 1: Pages 96 -145

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I	Mathematics for B.Sc.Br.–I, Second Semester, Volume II	P.Kandasamy and K.Thilagavathy	S.Chand and Company Pvt Ltd, First Edition Reprint 2015
II,III &IV	Mathematics for B.Sc.Br.–I, Third Semester, Volume III	P.Kandasamy and K.Thilagavathy	S.Chand and Company Pvt Ltd, First Edition Reprint 2015
I & V	Mathematics for B.Sc.Br.–I, Fourth Semester, Volume IV	P.Kandasamy and K.Thilagavathy	S.Chand and Company Pvt Ltd, First Edition 2005

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	Ancillary Mathematics Book II	S.Narayanan and T.K.Manicavasagam Pillay	S.Viswanathan (Printers & Publishers), Pvt. Ltd., Reprint - 2002.
2	Ancillary Mathematics, volume II	S.Arumugan, A.Thangapandi and Issac	New Gamma Publishing House, Palayamkottai, 2002.

BBA(Computer Applications)

Semester IV

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Part III - Allied IV Mathematical Techniques	**Course Code: 417AV4**
Semester: IV	**No. of Credits: 4**
No. of hours :90 (Total hours)	**C:T: 75 : 15**
CIA Max. Marks: 25	**ESE Max. Marks: 75**

(C:Contact hours, T:Tutorial)

Course Objectives:

The objectives of this course are

- to enable them to compare, interpret and analyze the data.
- to take efficient decisions and implement them in an effective way.
- to develop logical reasoning in sequencing jobs in a network to trace the shortest route.
- to choose the optimum strategy among the alternatives.

Course Outcomes: On completion of the Course the student will be able to

CO	Statement	Bloom's Taxonomy level
CO1	compute the measures of central tendency	**U**
CO2	estimate the measures of dispersion	**U**
CO3	construct index numbers	**A**
CO4	recognize the limitations of correlation	**R**
CO5	compute regression equations	**U**
CO6	apply optimization in networks.	**A**

R-Remembrance U-Understanding A-Apply

Syllabus:

Unit I:	**15 hrs**
Measures of Central Tendency: Arithmetic Mean (Direct Method only) – Median – Mode – Positional Measures. Book 1: Part II: Pages 159 - 250, 271 - 299	

Unit II	**15 hrs**
Measures of Dispersion: Importance or Significance of measures of dispersion – Range –	

Quartile Deviation (Q.D) – Mean deviation or Average deviation(Direct Method only) – Standard Deviation(Direct Method only) – Coefficient of variation.
Book 1: Part II: Pages 301 - 368

Unit III **15 hrs**

Index Numbers: Characteristics of Index Numbers–Uses– General Problems in the Construction of index numbers – Formulae – Tests of consistency and adequacy – Circular Test – Fixed Base – Chain Base – Cost of living Index. **Simple Linear Correlation:** Simple or Partial or Multiple – Linear or Non–linear or No correlation – Scatter diagram – Karl–Pearson's coefficient of correlation – Spearman's Rank correlation coefficient.
Book 1: Part II: Pages 444 - 471, 503 - 522

Unit IV **15 hrs**

Simple Linear Regression: Uses – Correlation and Regression – Two Regression lines – Methods of forming the Regression equations – Properties of Regression lines and coefficients.
Book 1: Part II: Pages 540 – 578

Unit V **15 hrs**

Network Scheduling by PERT/CPM: Introduction – Network: Basic components – Logical sequencing – Rules of Network construction – Critical path analysis – Probability considerations in PERT – Distinction between PERT and CPM.
Book 2: Chapter 25: Sections 25.1 – 25.4, 25.6 – 25.8

Note: Only statements of the theorems and algorithms are included.

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I - III	Business Mathematics and Statistics	PA. Navnitham	Jai Publishers, Latest edition, May 2016.
IV, V	Operations Research	Kantiswarup, P.K.Gupta and Manmohan	Sultan chand & Sons, Eighteenth Edition 2015

Books for Reference:

S. No	Name of the Book	Authors	Publishers with Edition
1	Introduction to Business Mathematics	V.Sundaresan and S.D. Jayaseelan	S.Chand and Company, 1997
2	Statistics	R.S.N. Pillai and V.Bagavathy	S.Chand and company, 1995
3	Operations Research: An Introduction	Hamdy A. Taha	Macmillan Publishing Company, Seventh Edition, 2002

4	Linear programming	L.S.Srinath	Affiliated east west, 1982

Employability Courses

M.Sc Mathematics

Semester I

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core I Algebra	**Course Code:17MM01**
Semester: I	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: S:52:10:13**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T: Tutorial, S: Seminar)

Course Objectives:

The objectives of this course are

- to study the advanced concepts in abstract and linear algebra which have wider applications in Higher analysis, Theory of numbers, Geometry etc., with the inclusion of Ring theory, Field theory etc in the syllabi.
- to realize the importance of Sylow's theorem and the fundamental theorem of Galois theory which speak more about the relation between the order of a group, its subgroups, prime numbers, fixed field of automorphisms of a field and splitting field.
- to understand about the interplay between the Algebras of linear transformations and the matrix theory.

Syllabus:

Unit I:	**13 hrs**
Group Theory: Another Counting Principle – Sylow's Theorem – Direct Products. Chapter 2 (Sections 2.11 – 2.13)	

Unit II	**13 hrs**
Ring Theory: Polynomial Rings – Polynomials over the Rational Field – Polynomial Rings over Commutative Rings. Chapter 3 (Sections 3.9 – 3.11)	

Unit III	**13 hrs**
Fields: Extension Fields-Roots of Polynomials – More about Roots. Chapter 5 (Sections 5.1, 5.3, 5.5)	

Unit IV	**13 hrs**
Fields: The Elements of Galois Theory Chapter 5 (Section 5.6)	

***Unit V**	**13 hrs**
Vector Spaces and Modules: Modules. Selected Topics: Finite Fields Chapter 4 (Section 4.5) Chapter 7 (Section 7.1)	

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I- V	Topics in Algebra	I.N.Herstein	Wiley Eastern Limited, Second Edition, Reprint2015.

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	A first course in Abstract Algebra	John B.Fraleigh	Addison-Wesley Publishing Company, Tenth printing, 2003.
2	Modern Algebra	Surjeet singh and Qazi Zameeruddin	Vikas Publishing house Private Limited, Third Edition, 2005.

M.Sc Mathematics

Semester I

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core II Real Analysis	**Course Code:17MM02**
Semester: I	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: S:52:10:13**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T: Tutorial, S: Seminar)

Course Objectives:

The objectives of this course are

- to extend the mean value theorem and Taylor's formula for higher dimensional spaces which have many applications in optimization theory.
- to study the Lebesgue integrals and General Lebesgue measure essential to solve problems in modern mathematics

Syllabus:

Unit I	**13 hrs**
Multivariable Differential calculus: Introduction – The directional derivative – Directional derivatives and continuity – The total derivative – The total derivative expressed in terms of partial derivatives – An application to complex-valued functions – The matrix of a linear function – The Jacobian matrix – The chain rule – Matrix form of the chain rule – The Mean- value theorem for differentiable functions – A sufficient condition for differentiability – A sufficient condition for equality of mixed partial derivatives Book I: Chapter 12 : Sections (12.1 – 12.13)	

Unit II	**13 hrs**

Lebesgue Measure: Introduction – Outer measure – Measurable sets and Lebesgue measure – A nonmeasurable set – Measurable functions – Littlewood's three Principles.
Book II: Chapter 3 : Sections (1 - 6)

***Unit III** **13 hrs**

The Lebesgue Integral : The Riemann Integral – The Lebesgue integral of a bounded function over a set of finite measure – The integral of a nonnegative function – The general Lebesgue integral – Convergence in measure.
Book II: Chapter 4: Sections (1 - 5)

Unit IV **13 hrs**

Differentiation and Integration : Differentiation of monotone functions – Functions of bounded variation – Differentiation of an integral – Absolute Continuity.
Book II : Chapter 5 : Sections(1 - 4)

Unit V **13 hrs**

Measure and Integration : Measure spaces – Measurable functions – General Convergence Theorems – Signed measure – The Radon - Nikodym Theorem.
Book II: Chapter 11 : Sections (1,2,4 - 6)

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I	Mathematical Analysis	Tom M.Apostol	Narosa Publishing House, New Delhi, Second Edition, Twentieth Reprint – 2002
II- V	Real Analysis	H.L.Royden	PHI Learning Private Limited Third Edition,Reprint 2009.

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Measure Theory and Integration	G.de.Barra	Wiley Eastern Limited, 1981
2	An Introduction to measure and Integration	Inder K.Rana	Narosa Publishing House, 2005.

M.Sc Mathematics

Semester II

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core V - Complex Analysis	**Course Code:17MM05**
Semester: II	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: S:52:10:13**

CIA Max. Marks: 25	ESE Max. Marks:75

(C: Contact hours, T: Tutorial, S: Seminar)

Course Objectives:

This course is introduced with the following objectives

- to impart knowledge and understanding in the advanced topics such as Normal families, Conformal mappings and Elliptic functions.
- to help the students to take up research activities in the field of complex analysis.

Syllabus:

Unit I:	**13 hrs**

Complex Integration: Fundamental Theorems: Line Integrals – Rectifiable Arcs – Line Integrals as Functions of Arcs – Cauchy's Theorem for a Rectangle –Cauchy's Theorem in a Disk. Harmonic Functions: Definition and Basic Properties – The Mean -value Property – Poisson's Formula – Schwarz's Theorem.

Chapter 4 Sections (1.1-1.5, 6.1-6.4)

Unit II:	**13 hrs**

Series and Product Developments: Partial fractions and Factorization: Partial Fractions – Infinite Products–Canonical Products–The Gamma function.

Entire functions :Jensen's Formula .

Chapter 5 Sections (2.1-2.4, 3.1)

Unit III:	**13 hrs**

Series and Product Developments: Normal Families : Equicontinuity – Normality and Compactness – Arzela's Theorem – Families of Analytic Functions –The Classical Definition. Conformal mapping. Dirichlet's Problem: The Riemann Mapping Theorem: Statement and Proof- Boundary Behavior – Use of the Reflection Principle – Analytic Arcs.

Chapter 5 Sections (5.1- 5.5) Chapter 6 Sections (1.1- 1.4)

Unit IV:	**13 hrs**

Conformal Mapping. Dirichlet's Problem: A Closer Look at Harmonic Functions: Functions with the Mean-value Property – Harnack's Principle. The Dirichlet Problem: Subharmonic Functions – Solution of Dirichlet's Problem.

Chapter 6 Sections (3.1, 3.2, 4.1, 4.2)

***Unit V:**	**13 hrs**

Elliptic Functions: Simply Periodic Functions: Representation by Exponentials – The Fourier Development – Functions of Finite Order. Doubly Periodic Functions: The Period Module – Unimodular Transformations – The Canonical Basis – General Properties of Elliptic Functions.The Weierstrass Theory:The Weierstrass ρ-function – The Functions $\zeta(z)$ and $\sigma(z)$- The Differential Equation.

Chapter 7 Sections (1.1-1.3, 2.1-2.4, 3.1-3.3).

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Complex analysis	Lars. V.Ahlfors	McGraw-Hill Education India Private

			Limited,New Delhi, Third Edition,Second Reprint 2013.

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Complex Analysis	Serge Lang	Springer-Verlag New York, Third Edition 1993
2	Real and Complex analysis	Walter Rudin	McGraw Hill Book Company, 7th reprint 2009.

M.Sc Mathematics

Semester III

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core IX Topology	**Course Code: 17MM09**
Semester: III	**No. of Credits: 4**
No. of hours :75(Total hours)	**C:T: S: 52:10:13**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T: Tutorial S: Seminar)

Course Objectives:

The objectives of the course are

- to understand modern pure mathematics.
- to make use of ideas and methods in Topology to analysis and Geometry.
- to lay foundation for further study in Algebraic Topology.

Syllabus:

Unit I:	**13 hrs**
Topological Spaces and Continuous Functions: Topological spaces – Basis for a Topology – The Order Topology – The Product Topology on X x Y – The Subspace Topology – Closed Sets and Limit Points – Continuous Functions. Chapter 2 (Sections 12-18)	

Unit II:	**13 hrs**
Topological Spaces and Continuous Functions: The Metric Topology. Connectedness and Compactness : Connected Spaces – Connected Subspaces of the Real Line – Components and Local Connectedness. Chapter 2 (Sections 20) Chapter 3 (Sections 23-25)	

***Unit III:**	**13 hrs**
Connectedness and Compactness: Compact Spaces – Compact Subspaces of the Real Line – Limit point Compactness. Countability and Separation Axioms: The Countability Axioms – The Separation Axioms – Normal Spaces. Chapter 3 (Sections 26 – 28) Chapter 4 (Sections 30 – 32)	

Unit IV:	**13 hrs**
Countability and Separation Axioms: The Urysohn Lemma – The Urysohn Metrization Theorem – The Tietze Extension Theorem. The Tychonoff Theorem: The Tychonoff Theorem – The Stone-Cech Compactification. Chapter 4 (Sections 33 – 35) Chapter 5 (Sections 37 – 38)	

Unit V:	**13 hrs**
Metrization Theorems and Paracompactness: Local finiteness – The Nagata - Smirnov Metrization Theorem – Paracompactness – The Smirnov Metrization Theorem. Chapter 6 (Sections 39 – 42)	

Note : Exclude supplementary exercises.

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Topology	James R. Munkres	Pearson New International Edition, Second Edition, 2015

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Topology	J. Dugundji	Universial Book Stall, New Dehi, 1975.
2	Topology and Modern Analysis	George F.Simmons	McGraw Hill Book Company, 13th Reprint 2010

M.Sc Mathematics

Semester III

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core X – Classical Mechanics	**Course Code:17MM10**
Semester: III	**No. of Credits: 4**
No. of hours :75(Total hours)	**C:T: S: 52:10:13**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T:Tutorial, S: Seminar)

Course Objectives:

The objectives of this course are

- to acquire knowledge in solving Mechanical problems.
- to become acquainted with Mathematical technologies and procedures which are useful in other fields of physics.
- to understand and appreciate the working of objects like motion of planets, motion of rockets etc.,

Syllabus:

Unit I:	**13 hrs**
Introductory Concepts: The Mechanical System – Generalized Co-ordinates – Constraints –	

Virtual Work – Energy and Momentum.
Chapter 1 : (Sections 1.1 – 1.5)

Unit II **13 hrs**

Lagrange's Equations: Derivation of Lagrange's Equations – Examples – Integrals of the Motion.
Chapter 2 : (Sections 2.1 – 2.3)

Unit III **13 hrs**

Hamilton's Equations: Hamilton's principle – Hamilton's Equations – Other variational Principles – Phase space.
Chapter 4: (Sections 4.1 – 4.4)

***Unit IV** **13 hrs**

Hamilton – Jacobi theory: Hamilton's Principal function – The Hamilton Jacobi equation – Separability.
Chapter 5 : (Sections 5.1 – 5.3)

Unit V **13 hrs**

Canonical Transformations: Differential forms and generating functions – Special transformations – Lagrange and Poisson brackets.
Chapter 6 : (Sections 6.1 – 6.3)

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I- V	Classical Dynamics	Donald T. Greenwood	Prentice Hall of India Private Ltd, New Delhi 1985.

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Classical Mechanics	Herbert Goldstein	Second Edition – Addison Wesley Publishing company, 1988.
2	John L. Synge and Byron A. Griffith	Principles of Mechanics	International Student Edition – McGraw Hill – Koga Kusha Ltd, 1970.

M.Sc Mathematics
Semester III
(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Elective III - Graph Theory	Course Code:17MME5
Semester: III	No. of Credits: 4
No. of hours :90 (Total hours)	C:T: S: 62:12:16
CIA Max. Marks: 25	ESE Max. Marks:75

(C:Contact hours, T:Tutorial,S:Seminar)

Course Objectives:

The objectives of this course are

- to familiarize the various concepts in Graph Theory
- to apply the knowledge wherever it is possible.

Syllabus:

Unit I:	**15 hrs**
Graphs and Subgraphs : Graphs and Simple Graphs - Graph Isomorphism-The Incidence and Adjacency Matrices- Sub Graphs-Vertex Degrees-Paths and Connection - Cycles. Trees:Trees - Cut Edges and Bonds - Cut Vertices – Cayley's formula. Chapter 1(Sections 1.1-1.7) , Chapter 2(Sections 2.1-2.4)	

Unit II	**16 hrs**
Connectivity: Connectivity-Blocks. Euler Tours and Hamilton Cycles: Euler Tours -Hamilton Cycles. Chapter 3(Sections 3.1, 3.2) Chapter 4(Sections 4.1, 4.2)	

***Unit III**	**16 hrs**
Matchings: Matchings - Matchings and Coverings in Bipartite Graphs – Perfect Matching. Edge Colourings: Edge Chromatic Number - Vizing's Theorem. Chapter 5(Sections 5.1-5.3) Chapter 6(Sections 6.1,6.2)	

Unit IV	**16 hrs**
Independent Sets and Cliques: Independent Sets - Ramsey's Theorem.Vertex Colorings: Chromatic Number - Brook's Theorem - Hajos Conjecture-Chromatic Polynomials. Chapter 7(Sections 7.1,7.2) Chapter 8(Sections 8.1-8.4)	

Unit V	**15hrs**
Planar Graphs: Plane and planar graphs-Dual graphs - Euler's formula – Bridges - The five Color theorem and four Color conjecture – Non Hamiltonian planar graphs. Chapter 9(Sections 9.1-9.4, 9.6 & 9.7)	

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I- V	Graph theory with Applications	J.A. Bondy and U.S.R. Murty	MacMillan London, First Edition ,1976.

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	A First Look at Graph Theory	J.Clark and D.A. Holton	Allied Publishers New Delhi 1995
2	Graph Theory	Frank. Harary	Narosa Publishing House,Tenth Reprint,2001.
3	Graph Theory Modelling, Applications and Algorithms	Geir Agnarsson, Raymond Greenlaw	Pearson ,Third Impression 2011.
4	Graph Theory with Applications to Engineering and Computer Science	Narsingh Deo	Prentice Hall of India 2005.

M.Sc Mathematics

Semester IV

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Core XV – Fluid Dynamics	**Course Code:17MM15**
Semester: IV	**No. of Credits: 4**
No. of hours :90(Total hours)	**C:T: S: 62:12:16**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T: Tutorial, S: Seminar)

Course Objectives:

The objectives of this course are

- to understand the general properties of fluid motion such as continuity, pressure, dynamical equation, energy, vorticity etc.,
- to know the tensor methods applied to the flow of viscous fluids.
- to know the outline of the theory of two dimensional laminar flow in boundary layer
- to apply the aerofoil theory in aerodynamics.

Syllabus:

Unit I:	**16 hrs**

Bernoulli's equation: Introductory notions – Physical dimensions – Velocity – Stream lines and paths of the particles – Stream tubes and filaments – Density – Pressure. Equations of motion: Differentiation with respect to the time – The equation of continuity – Boundary conditions (both kinematical and Physical) – Rate of change of linear momentum – The equation of motion of an inviscid fluid.

Book 1: Chapter I (Sections 1.0-1.3) Chapter III (Sections 3.10-3.31, 3.40, 3.41)

Unit II	**15 hrs**

Equations of motion: Euler's momentum theorem – Conservative forces – Lagrangian form of the equation of motion – Steady motion – The energy equation – Rate of change of circulation – Vortex motion – Permanence of Vorticity.

Book 1: Chapter III (Sections 3.42-3.53)

Unit III	**15 hrs**
Two dimensional motion: Introduction – Two dimensional functions – Basic singularities – Method of images – Conformal transformation – The Aerofoil. Book 2: Chapter III (Sections 3.1-3.3, 3.5-3.7)	

Unit IV	**16 hrs**
Dynamics of real fluids: The equations of motion for viscous flow – Some exact solutions of the Navier-Stokes equations. Book 2: Chapter V (Sections 5.2,5.3.1-5.3.3)	

***Unit V**	**16 hrs**
The laminar boundary layer in incompressible flow: Introduction – The boundary layer equations – Analytic solutions of the boundary layer equations. Book 2: Chapter VI (Sections 6.1-6.3)	

Books for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I -II	Theoretical Hydrodynamics	L.M.Milne – Thomson	Dover Publications, New york, Fifth Edition, 1996.
III- V	Modern Fluid Dynamics	N.Curle and H.J.Davies	Volume I, D.Van Nostrand Co., London, 1968.

Books for Reference:

S.No.	**Name of the Book**	**Authors**	**Publishers with Edition**
1.	Fundamentals of fluid Mechanics	S.W.Yuan	Prentice Hall of India, Pvt. Ltd.,1988.
2.	Fluid Mechanics	John F. Douglas, Janusz M.Gasiorek and John A. Swaffield	Pearson Education Ltd., Fourth Edition, 2002.

M.Sc Mathematics

Semester IV

(For the students admitted during the academic year 2017 – 2018 and onwards)

Course: Elective IV– Special Functions	**Course Code:17MME7**
Semester: III	**No. of Credits: 4**
No. of hours :90(Total hours)	**C:T: S: 62:12:16**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T: Tutorial, S: Seminar)

Course Objectives:

The objectives of this course are

- to give a thorough knowledge of special functions such as Legendre Polynomials, Bessel's functions, Hermite's Polynomial, Legurre and Chebychev Polynomials
- to facilitates the students to take up the SLET and NET examinations with confidence.

Syllabus:

Unit I:	**16 hrs**
Legendre's Equation: Legendre's Equation-Solution of Legendre's Equation-Definition of $P_n(x)$ and $Q_n(x)$ – General solution of Legendre's Equation – To show the $P_n(x)$ is the co-efficient of h^n in the expansion of $(1-2xh+h^2)^{-1/2}$ – Laplace's definite integral for $P_n(x)$ – Orthogonal properties of Legendre's polynomials – Recurrence formulae – Beltrami's results – Christoffel's Expansion - Christoffel's summation formula – Rodrigue's formula – Even and odd functions. Chapter 2 (2.1-2.13)	

Unit II	**15 hrs**
Bessel's Equation . Chapter 5.	

***Unit III**	**16 hrs**
Hermite Polynomials . Chapter 6.	

Unit IV	**16 hrs**
Laguerre Polynomials. Chapter 7.	

Unit V	**15 hrs**
Chebyshev Polynomials . Chapter 8	

Book for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I -V	Special Functions	J.N. Sharma and Dr.R.K.Gupta	Krishna Prakashan Mandir ,Sixteenth edition 1992-93.

Books for Reference:

S.No.	**Name of the Book**	**Authors**	**Publishers with Edition**
1.	Text book of Ordinary Differential Equations	S. G. Deo, V.Lakshmikantan, V. Raghavendra	Tata McGraw-Hill Publishing Company Ltd, New Delhi,Second Edition,16thReprint – 2010.

2.	Mathematical Physics	Gupta B.D	Vikas Publishing House, Fourth Edition, 2010
3.	Mathematical Physics	Sathyaprakash	Sultan Chand & Sons ,5th revised edition,2011

Entrepreneurship Courses

M.Sc Mathematics

Semester I

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core IV –Optimization Techniques I	**Course Code:17MM04**
Semester: I	**No. of Credits: 4**
No. of hours :60(Total hours)	**C:T: S:40:10:10**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T:Tutorial, S:Seminar)

Course Objectives:

The objectives of this course are to

- comprehend the modeling of real life situations
- locate the best or optimal solution to a problem
- enable the students to take quick and effective decisions in various walks of life
- apply the techniques of optimization in appropriate situations

Syllabus:

Unit I	**10 hrs**
Duality: Definition of the Dual Problem-Primal-Dual Relationships-Additional Simplex Algorithms: Dual simplex algorithm- Integer Linear programming: Integer programming Algorithms: Cutting - Plane Algorithm. Chapter 4 (Sections 4.1, 4.2,4.4.1) Chapter 9 (Section 9.2(9.2.2))	

Unit II	**10 hrs**
Advanced linear programming: Simplex method fundamentals – Revised simplex method. Chapter 7(Sections 7.1,7.2)	

Unit III	**10 hrs**
Network Models : Scope and Definition of Network models - Minimal Spanning Tree Algorithm – Shortest - Route Problem : Examples of the Shortest Route Applications – Shortest -Route Algorithms-Maximal Flow Model. Chapter 6(Sections 6.1,6.2,6.3(6.3.1,6.3.2),6.4)	

Unit IV	**10 hrs**
Deterministic Dynamic Programming : Recursive Nature of Computations in DP – Forward and Backward Recursion – Selected DP Applications : Knapsack / Flyaway/Cargo –Loading Model-Work-Force size Model- Equipment Replacement Model- Investment Model– Problem of	

Dimensionality. Chapter 10 (Sections 10.1 – 10.3(10.3.1-10.3.4),10.4)

***Unit V**	**10 hrs**
Deterministic Inventory Models: General Inventory Model – Static Economic Order Quantity (EOQ) Models – Dynamic EOQ Models:Set up model. Chapter 11 (Sections 11.1 ,11.3,11.4.2)	

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Operations Research – An Introduction	Hamdy A.Taha	Pearson Education Inc Limited, Eighth Edition, 2008.

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Introduction to Operations Research	Frederick S. Hillier, Gerald J.Lieberman	McGraw-Hill Book Company, Eighth Edition 2007.
2	Operations Research-Applications and Algorithms	Wayne.L.Winston	Thomson Asia.Pvt Ltd, Fourth edition, 2003.

M.Sc Mathematics

Semester II

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core VIII Optimization Techniques II	**Course Code:17MM08**
Semester: II	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: S: 52:10:13**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T: Tutorial, S: Seminar)

Course Objectives:

The objectives of this course are

- to specialize in inventory management, that forms the basis of supply chain management
- to specialize in queuing concepts that has wide applications like processor scheduling etc.

Syllabus:

Unit I:	**13 hrs**
Probabilistic Inventory Models: Continuous Review Models – Single – Period Models-Multiperiod Model. Chapter 14(Sections 14.1-14.3)	

Unit II:	**13 hrs**
Queuing Systems : Elements of a Queuing Model – Role of Exponential Distribution – Pure	

Birth and Death Models (Relationship Between the Exponential and Poisson Distributions) – Generalized Poisson Queuing Model
Chapter 15 (Sections 15.2 – 15.5)

Unit III: 13 hrs

Specialized Poisson Queues: Steady state Measures of Performance-Single server models– Multiple server model-Machine servicing model.
Chapter 15 (Sections 15.6.1 – 15.6.4)

***Unit IV: 13 hrs**

Game Theory: Optimal solution of Two Person Zero –sum-games – Solution of Mixed Strategy Games. Markov Chains: Definition of a Markov Chain – Absolute and n-step transition probabilities- Classification of States.
Chapter 13(Sections 13.4.1-13.4.2) Chapter 17(Sections 17.1-17.3)

Unit V: 13 hrs

Classical Optimization Theory: Unconstrained Problems – Constrained Problems – Equality constraints-Inequality constraints – Karush-Kuhn-Tucker (KKT) Conditions
Chapter 18(Sections 18.1.1, 18.2.1,18.2.2)

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Operations Research – An Introduction	Hamdy A.Taha	Pearson Education Inc Limited, Eighth Edition, 2008

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Operations Research	G.Srinivasan	Principles and Applications PHI Learning Private Limited, Second printing, 2008
2	Operations Research	Wayne.L.Winston	Applications and Algorithms, Thomson Asia. Pvt Ltd, Fourth edition, 2003.

Skill Development Courses

M.Sc Mathematics
Semester I
(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core III Ordinary Differential Equations	**Course Code:17MM03**
Semester: I	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: S:52:10:13**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T: Tutorial , S:Seminar)

Course Objectives:

The objectives of this course are

- to formulate differential equations related to real world problems
- to study various types of differential equations and the different methods of solving them.
- to study the qualitative properties of solutions.

Syllabus:

Unit I	**13 hrs**
Linear Differential Equations of Higher Order: Introduction – Higher Order Equations – A Modelling Problem – Linear Independence – Equations with Constant coefficients – Equations with Variable coefficients – Wronskian – Variation of Parameters – Some Standard Methods – Method of Laplace Transforms. Chapter 2: Sections (2.1 –2.10)	

Unit II	**13 hrs**
Solutions in Power Series: Introduction – Second Order Linear Equations with Ordinary Points – Legendre Equation and Legendre Polynomials – Second Order Equation with Regular Singular Point – Properties of Bessel Functions. Chapter 3: Sections(3.1 – 3.5)	

***Unit III**	**13 hrs**
Systems of Linear Differential Equations: Introduction – Systems of First Order Equations – Model for Arms Competition between Two Nations – Existence and Uniqueness Theorem – Fundamental Matrix – Non-homogeneous Linear systems – Linear systems with Constant coefficients – Linear systems with Periodic Coefficients. Chapter 4: Sections (4.1 – 4.8)	

Unit IV	**13 hrs**
Existence and Uniqueness of Solutions: Introduction – Preliminaries – Successive Approximations – Picard's Theorem – Some Examples – Continuation and Dependence on Initial Conditions – Existence of Solutions in the Large – Existence and Uniqueness of Solutions of Systems – Fixed point Method. Chapter 5: Sections (5.1 – 5.9)	

Unit V	**13 hrs**
Boundary Value Problems: Introduction – Sturm – Liouville Problem – Green's Function – Application of Boundary Value Problems(BVP) – Picard's Theorem. Chapter 7: Sections (7.1 – 7.5)	

Books for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I -V	Text book of Ordinary Differential Equations	S. G. Deo, V.Lakshmikantham, V. Raghavendra	Tata McGraw-Hill Education Private Ltd, New Delhi, Second Edition,18^{th} Reprint – 2012.

Books for Reference:

S.No.	**Name of the Book**	**Authors**	**Publishers with Edition**

1	An Introduction to Ordinary Differential Equations	Earl.A.Coddington	Prentice Hall of India Pvt., Ltd., - 1987.
2	Ordinary Differential Equations	Robert H. Martin. Jr.,	McGraw-Hill Book Company, Second Printing – 1985.

M.Sc Mathematics

Semester I

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Elective I – Number Theory	**Course Code:17MME1**
Semester: I	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T:S: 52:10:13**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C:Contact hours, T:Tutorial, S:Seminar)

Course Objectives:

The objectives of this course are

- to convert all the problems of modern mathematics into the problems of Number theory.
- to improve the problem solving skills using the concepts of the Congruences and Diophantine equations
- to know the applications in Cryptography and Network security
- to help the students to understand and attempt the new problems with more insight

Syllabus:

Unit I:	**13 hrs**
Divisibility : Introduction – Divisibility – Primes. Congruences : Congruences – Solutions of congruences Chapter 1 (Sections 1.1 – 1.3) Chapter 2 (Sections 2.1 – 2.2)	

Unit II:	**13 hrs**
Congruences : Congruence of Degree 1- The function $\phi(n)$ – Congruences of Higher Degree – Prime Power Moduli- Prime Modulus Chapter 2 (Sections 2.3 – 2.7)	

Unit III	**13 hrs**
Congruences : Congruences of Degree two, Prime modulus – Power Residues. Quadratic Reciprocity: Quadratic Residues – Quadratic Reciprocity – The Jacobi symbol. Chapter 2 (Sections 2.8 – 2.9) Chapter 3 (Sections 3.1 – 3.3)	

***Unit IV**	**13 hrs**
Some Functions of Number Theory: Greatest Integer Function – Arithmetic Functions – The Moebius Inversion Formula – The multiplication of Arithmetic Functions – Recurrence functions. Chapter 4 (Sections 4.1 – 4.5)	

Unit V	**13 hrs**
Some Diophantine Equations: Diophantine Equations-The equation ax + by = c – Positive Solutions – Other Linear equations – The equation $x^2+y^2=z^2$ –The equation $x^4 + y^4 = z^2$ – Sums of four and five squares – Waring's problems – Sum of fourth powers – Sum of two squares – The equation $4x^2 + y^2 = n$ – The equation $ax^2+by^2+cz^2 = 0$ – Binary Quadratic Forms – Equivalence of Quadratic Forms. Chapter 5 (Sections 5.1 – 5.14)	

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	An Introduction to Theory of Numbers	Ivan Niven and Herbert S. Zuckerman	Wiley Eastern Ltd, Third Edition, 1991 Reprint.

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Introduction to Analytic Number Theory, Springer International Student Edition	T.M. Apostol	Narosa Publishing House, Seventh Reprint 2010.
2	Elementary Number Theory	David M.Burton	University Press, 2008

M.Sc Mathematics

Semester II

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core VI - Partial Differential Equations	**Course Code:17MM06**
Semester: II	**No. of Credits: 4**
No. of hours : 90 (Total hours)	**C:T: S:62:12:16**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T: Tutorial, S: Seminar)

Course Objectives:

The objectives of this course are

- to provide an exposure to the various concepts of partial differential equations with the underlying principles.
- to comprehend the categories of partial differential equations, their characteristics and solutions.

- to learn different techniques of solving partial differential equations and therby interpret the solutions.
- to help the students to understand the wide range of applications with ample illustrations.

Syllabus:

Unit I:	**16 hrs**
Mathematical Models: Classical Equations – The Vibrating String – The Vibrating Membrane-Conduction of heat in solids-The Gravitational Potential. Classification of Second – Order Linear Equations: Second – Order equations in Two Independent Variables – Canonical forms – Equations with Constant Coefficients – General Solutions – Summary and Further Simplification – Exercises. Chapter 3 Sections (3.1 – 3.3, 3.5, 3.6) Chapter 4 Sections (4.1 – 4.6)	

Unit II:	**15hrs**
The Cauchy Problem and Wave Equations : The Cauchy Problem – Homogeneous Wave Equations – Initial Boundary – Value Problems – Equations with Non homogeneous Boundary Conditions – Vibration of Finite String with Fixed Ends – Non homogeneous Wave Equations – Solution of the Goursat Problem – Exercises. Chapter 5 Sections (5.1, 5.3 – 5.7, 5.9, 5.12)	

***Unit III:**	**16hrs**
Method of Separation of Variables: Introduction – Separation of Variables – The Vibrating String Problem – Existence and Uniqueness of Solution of the Vibrating String Problem – The Heat Conduction Problem – Existence and Uniqueness of Solution of the Heat Conduction Problem – The Laplace and Beam Equations – Nonhomogeneous Problems – Exercises. Chapter 7 Sections (7.1 – 7.9)	

Unit IV:	**16hrs**
Boundary – Value Problems and Applications : Boundary –Value Problems – Maximum and Minimum Principles – Uniqueness and Continuity Theorems –Dirichlet Problem for a Circle –Dirichlet Problem for a Circular Annulus – Neumann Problem for a Circle – Dirichlet Problem for a Rectangle – Dirichlet Problem Involving the Poisson Equation –The Neumann Problem for a Rectangle – Exercises. Chapter 9 Sections (9.1 – 9.10)	

Unit V:	**16hrs**
Green's Functions and Boundary-Value Problems : Introduction – The Dirac Delta Function – Properties of Green's Functions – Method of Green's Functions – Dirichlet's Problem for the Laplace Operator – Dirichlet's Problem for the Helmholtz Operator – Method of Images	

– Method of Eigenfunctions Chapter 11 Sections (11.1 – 11.8)

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Linear Partial Differential Equations for Scientists and Engineers.	Tyn Myint – U Lokenath Debnath	McGraw-Hill Education India Private Limited, New Delhi, Third Edition, Second Reprint 2013.

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Elements of Partial Differential Equations,	Ian.N.Sneddon	Dover Publications, 1st Edition-2006.
2	Differential Equations for Scientists and Engineers	J.B.Doshi	Narosa Publishing House, 2010.

M.Sc Mathematics
Semester II
(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core VII - Numerical Analysis	**Course Code:17MM07**
Semester: II	**No. of Credits: 4**
No. of hours :90 (Total hours)	**C:T: S:62:12:16**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T:Tutorial, S: Seminar)

Course Objectives:

The objectives of this course are

- to expose the students to various numerical methods available for solving algebraic and differential equations
- to help the students to develop their skills in numerical computation
- to expose the students to solve problems in physical and management sciences and in engineering using numerical techniques

Syllabus:

Unit I:	**15 hrs**
Solution of Linear Systems A X = B : Upper-Triangular Linear Systems – Gaussian Elimination and Pivoting – Triangular Factorization – Iterative Methods for Linear Systems. Chapter 3 (Sections 3.3 – 3.6)	

Unit II:	**16 hrs**
Interpolation and Polynomial Approximation : Chebyshev Polynomials (Optional) – Pade Approximations. Curve Fitting : Least-Squares Line – Methods of Curve Fitting – Interpolation By Spline Functions . Chapter 4 (Sections 4.5 - 4.6) Chapter 5 (Sections 5.1 – 5.3).	

Unit III:	**16 hrs**
Solution of Differential Equations : Euler's Method – Heun's Method – Taylor Series Method – Runge-Kutta Methods – Predictor- Corrector Methods. Chapter 9 (Sections 9.2 – 9.6).	

Unit IV:	**15 hrs**
Solution of Partial Differential Equations: Hyperbolic Equations – Parabolic Equations – Elliptic Equations. Chapter 10 (Sections 10.1 – 10.3).	

***Unit V:**	**16 hrs**
Eigen values and Eigenvectors : Homogeneous Systems: Eigenvalue Problem – Power Method – Jacobi's Method – Eigenvalues of Symmetric Matrices. Chapter 11 (Sections 11.1 – 11.4).	

Note: Simple problems that can be done manually and using calculator are only included- Programs are excluded.

Book for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I-V	Numerical Methods using MATLAB.	John. H.Mathews, Kurtis D. Fink	PHI Learning Private Limited, New Delhi, Fourth Edition- 2012.

Books for Reference:

S.No.	**Name of the Book**	**Authors**	**Publishers with Edition**
1	Numerical methods for Scientific and engineering Computation	M.K.Jain, R.K. Jain and S.R.K.Iyengar	New Age International (P) Limited, Fourth Edition, 2003, Reprint 2004.
2	Applied Numerical Analysis	Curtis F.Gerald and Parick O.Wheatley	Pearson Education Pvt. Ltd., Sixth Edition, Fourth Indian reprint 2005.
3	Numerical Methods for Science and Engineering	R.G. Stanton	Prentice Hall of India Private Ltd, 1985

M.Sc Mathematics

Semester II

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Elective II Control Theory	**Course Code: 17MME3**
Semester: II	**No. of Credits: 4**
No. of hours :90(Total hours)	**C:T:S: 62:12:16**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T: Tutorial, S: Seminar)

Course Objectives:

The objectives of this course are

- to model any system based on physical law
- to identify a system based on physical law
- to analyze the controllability and stability of the system
- to synthesize the control input and apply it to the system

Syllabus:

Unit I:	**15 hrs**
Observability: Linear systems – Nonlinear systems. Exercises. Chapter 2	

Unit II:	**16 hrs**
Controllability: Linear systems – Nonlinear systems – Exercises [problems related to the Given topics]. Chapter 3 (Sections 3.1 – 3.2, 3.5)	

Unit III:	**16 hrs**
Stability: Linear systems – Perturbed Linear Systems - Nonlinear Systems – Exercises.[Problems related to the given topics]. Chapter 4 (Sections 4.1-4.3, 4.5)	

Unit IV:	**15 hrs**
Stabilizability: Stabilization via Linear Feedback control – The Controllable Subspace– Stabilization with Restricted Feedback - Exercises Chapter 5	

***Unit V:**	**16 hrs**
Optimal control: Linear Time Varying Systems – Linear Time Invariant Systems – Nonlinear Systems - Exercises. Chapter 6	

Book for study:

Unit	**Name of the Book**	**Authors**	**Publishers with Edition**
I-V	Elements of Control Theory	K.Balachandran and J.P.Dauer	Narosa Publishing House, New Delhi, Second Edition 2012.

Books for Reference:

S.No	**Name of the Book**	**Authors**	**Publishers with Edition**
1	Control Systems.	Naresh K.Sinha	New Age International Limited, Publishers, Third Edition, 1998
2	Ordinary Differential Equations	Robert H.Martin,Jr	International Student Edition Mc GrawHill Book Company, New Delhi, 2nd Printing – 1985.
3	Differential Equations	A.C.King ,	Cambridge University Press (2003),

	Linear, Non-Linear, Ordinary, Partial	J.Billingham and S.R. Otto	First South Asian Edition, 2005

M.Sc Mathematics

Semester III

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core XI - Programming With C++	**Course Code: 17MM11**
Semester: III	**No. of Credits: 4**
No. of hours :45(Total hours)	**C:T:S:30:6:9**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T:Tutorial, S: Seminar)

Course Objectives:

The objectives of this course are to

- empower the software developing skills of the student.
- enhance the ability of logical thinking.
- solve any complex real life problems with ease using computers.

Syllabus:

Unit I:	**9 hrs**
Tokens, Expressions and Control Structures: Introduction-Tokens - Keywords -Identifiers and Constants - Basic Data Types - User-Defined Data Types. Derived Data types - Symbolic Constants - Type Compatibility –Declaration of variables – Dynamic Initialization of Variables - Reference Variables – Operators in C++ - Scope Resolution Operator - Member Dereferencing Operators - Memory Management Operators – Manipulators - Type Cast Operator - Expressions and their Types – Special Assignment Expressions – Implicit Conversions – Operator Overloading – Operator Precedence – Control Structures. Chapter 3: (Sections 3.1 – 3.24).	

Unit II:	**9 hrs**
Functions in C++: Introduction – The Main Function – Function prototyping – Call by Reference – Return by Reference – Inline functions – Default Arguments – const Arguments Function overloading – Friend and Virtual Functions – Math Library Functions. Classes and Objects: Introduction – C Structures Revisited – Specifying a Class –Defining Member Functions – A C++ Program with Class – Making an Outside Function Inline – Nesting of Member Functions – Private Member Functions– Arrays within a Class – Memory Allocation for Objects – Static Data Members – Static Member Functions –Arrays of Objects – Objects as Function Arguments – Friendly Functions – Returning Objects – const Member functions – Pointers to Members – Local classes.	

Chapter 4 (Sections 4.1 – 4.11) Chapter 5 (Sections 5.1 – 5.19)

***Unit III:** **9 hrs**

Constructors and Destructors : Introduction - Constructors – Parameterized Constructors – Multiple Constructors in a Class - Constructors with Default Arguments – Dynamic Initialization of Objects – Copy Constructor – Dynamic Constructors –Constructing Two-Dimensional Arrays – const Objects - Destructors. Operator Overloading and Type Conversions: Introduction – Defining Operator Overloading - Overloading Unary Operators –Overloading Binary Operators – Overloading Binary Operators using Friends- Manipulation of Strings Using Operators– Rules for Overloading Operators

Chapter 6(Sections 6.1 – 6.11) Chapter 7(Sections 7.1 – 7.7)

Unit IV: **9 hrs**

Inheritance: Extending Classes: Introduction – Defining Derived Classes –Single Inheritance – Making a Private Member Inheritable–Multilevel Inheritance –Multiple Inheritance – Hierarchical Inheritance – Hybrid Inheritance – Virtual Base Classes – Abstract Classes – Constructors in Derived Classes – Member Classes:Nesting of Classes. Pointers, Virtual Functions and Polymorphism: Introduction – Pointers to Objects – this Pointer – Pointers to Derived Classes – Virtual Functions – Pure Virtual Functions

Chapter 8(Sections 8.1 – 8.12) Chapter 9 (Sections 9.1 - 9.7)

Unit V: **9 hrs**

Working with Files : Introduction – Classes for File Stream Operations – Opening and Closing a File – Detecting end-of-file – More about Open(): File Modes – File Pointers and their Manipulations - Sequential Input and Output Operations – Updating a File: Random Access – Error handling During File Operations – Command-line Arguments.

Chapter 11(Sections 11.1 - 11.10)

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Object Oriented Programming with C++	E.Balagurusamy	Tata McGraw Hill Publishing Company Limited. NewDelhi. Fourth Edition –Tenth Reprint 2010.

Books for Reference:

S.No	Name of the Book	Authors	Publishers with Edition
1	C++ - How to Program	Deitel and Deitel	Prentice- Hall, 1998.
2	Object Oriented Programming in Turbo C++	Robert Lefore	Waite Group Publications – 1999.

M.Sc Mathematics

Semester III

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core XI - Programming With C++ Practical	**Course Code: 17MMCP**

Semester: III	**No. of Credits: 4**
No. of hours :45(Total hours)	**P:T:30:15**
CIA Max. Marks: 40	**ESE Max. Marks:60**

(P: Practical,T:Tutorial)

Course Objectives:

The objectives of this course are to

- provide complete knowledge of Object Oriented Programming through C++
- enhance the programming skills of the students by giving practical assignments to be done in labs.
- learn how to write inline functions for performance.
- overload functions and operators in C++.

Syllabus:

List of programs	**30 hrs**

1. Sorting of Numbers(without using function)
2. Sorting of numbers (using function)
3. Numerical Integration by 1/3 rd Simpson's rule.
4. Solving First Order Ordinary Differential Equation using
   (i) Runge- Kutta Second order method.
   (ii) Runge- Kutta Fourth order method.
5. Solving First Order Ordinary Differential Equation using Adam's Predictor –Corrector method.
6. Generating Fibonacci series using recursion.
7. Finding the Addition, Subtraction, Multiplication and Division of Complex numbers.
8. Read the following information from the keyboard:
   - Employee name, Employee code, Designation, Years of experience, Age, Basic pay, Dearness allowance, HRA, deductions and execute the following features:
     (i) Insert a new entry
     (ii) Delete an entry
     (iii) List a table with employee details
     (iv) List a table with salary details
     (v) Sort the entries
9. Preparing a Mark Sheet of a University Examination with the following information:
   a) Name of the Student, Roll Number, Subject Code, Subject Name,
   b) Internal Marks and External Marks.

   The program should carry out the following tasks:
   a) Sort the students list by Name.
   b) Sort the students list by Rank. .

10. Simulation of a simple Banking System in which initial balance and the rate of interest are read from the keyboard and these values are initialized using the constructor member function.

    The program should consist of following methods:

    a. To initialize the balance and rate of interest using the constructor member function.
    b. To make deposit.
    c. To withdraw an amount from the balance.
    d. To find the Compound interest based on the rate of interest.
    e. To know the balance amount
    f. To display the menu options.

11. Swapping two variables of various data types, namely integers, floating point numbers and character types using function overloading.
12. Performing Simple arithmetic operations of two complex numbers using operator overloading.
13. Run Time Polymorphism using Virtual function
14. Creating a base class with data members, name, roll number and sex and a derived class with members, height and weight and declaring the derived class as an array of objects and using the member functions to display the contents of the array on the screen.
15. Illustration of how class objects can be written to and read from the disk files.

M.Sc Mathematics

Semester III

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core XII - Mathematical Modelling	**Course Code:17MM12**
Semester: III	**No. of Credits: 4**
No. of hours :75 (Total hours)	**C:T: S: 52:10:13**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T: Tutorial, S: Seminar)

Course Objectives:

The objectives of the course are to

- create awareness about various real life situations that can be modeled through mathematical models
- give a panoramic view of application of mathematics in Mathematical , Physical and Social sciences
- choose the appropriate technique among the available to obtain the desirable solutions.

Syllabus:

Unit I:	**13 hrs**

Mathematical Modelling through Ordinary Differential Equations of First order: Mathematical Modelling through Differential Equations-Linear Growth and decay Models- Non- Linear Growth and decay Models- Compartment Models- Mathematical Modelling in Dynamics through Ordinary Differential Equations of First Order.

Chapter 2 (Sections 2.1-2.5)

Unit II **13 hrs**

Mathematical Modelling Through Systems of Ordinary Differential Equations of the First Order: Mathematical Modelling in Population Dynamics- Mathematical Modelling of Epidemics Through Systems of Ordinary Differential Equations of First Order - Compartment Models through Systems of Ordinary Differential Equations - Mathematical Modelling in Economics based on Systems of Ordinary Differential Equations of First Order.

Chapter 3(Sections 3.1-3.4)

***Unit III** **13 hrs**

Mathematical Modelling Through Difference Equations:The Need for Mathematical Modelling Through Difference Equations:Some Simple Models-Basic Theory of Linear Difference Equations with Constant Coefficients- Mathematical Modelling Through Difference Equations in Economics and Finance.

Chapter5(Sections 5.1-5.3)

Unit IV **13 hrs**

Mathematical Modelling Through Partial Differential Equations: Situations giving rise to Partial Differential Equations Models – Mass-Balance Equations:First Method of Getting PDE Models Momentum – Balance Equations:The Second Method of Obtaining Partial Differential Equations Models – Variational Principles:Third Method of Obtaining Partial Differential Equation Models –Model for Traffic on a Highway.

Chapter 6(Sections 6.1-6.4, 6.6)

Unit V **13 hrs**

Mathematical Modelling Through Graphs: Situations that can be Modelled Through Graphs – Mathematical Models in Terms of Directed Graphs – Mathematical Models in Terms of Signed Graphs – Mathematical Modelling in Terms of Weighted Digraphs – Mathematical Modelling in Terms of Unoriented Graphs.

Chapter 7 (Sections 7.1-7.5)

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I- V	Mathematical Modelling	J.N Kapur	Wiley Eastern Limited, Second Edition, 2015.

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Mathematics for Economists	B.C. Mehra and G.M.K. Madani	Sultan Chand and Sons, Sixth Edition, 1988.
2	Differential Equations with applications and Historical Notes	George. F. Simmons	McGrawHill,Inc,2nd Edition1991.
3	Dynamics	M.K.Venkataraman	Agasthiar book deport, 13th edition 2009.

M.Sc Mathematics

Semester III

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Internship/Summer School Courses/ Sports Training	**Course Code: 17MMIS**
Semester: III	**No. of Credits: 2**
No. of hours : -	**I:T:R : -**
CIA Max. Marks: 50	**ESE Max. Marks: -**

I:Internship Training, T: Tutorial, R:Report)

Course Objectives:

Internship

The students have to select a school and take up teaching practice for a period of 10 days during their holidays to enhance their teaching ability and submit a report.

Summer School Courses

Students can attend Summer school programmes offered by Institutions of National reputation to enrich their knowledge and submit a report.

Sports Training

Students who are selected for District/State/National teams can attend sports camps. The certificate given by the concerned authorities can be treated as equivalent to the internship report.

M.Sc Mathematics

Semester IV

[For students admitted from the academic year 2017-2018 onwards]

Course: Project and Viva-Voce	**Course Code:17MMPV**
Semester: III & IV	**No. of Credits: 8**
No. of hours :45(Total hours)(III Semester) **No. of hours :90(Total hours) (IV Semester)**	**C:T:30:15(III Semester)** **C:T:60:30(IV Semester)**
CIA Max. Marks:100	**ESE Max. Marks: 100**

(C:Contact hours, T:Tutorial)

An individual project work has to be carried out in an emerging area/research articles from journals and a report must be submitted.

Course Objectives:

The objectives of this course are to

- create awareness of applications of Mathematics in physical, chemical and social sciences.
- develop, practice, and improve group communication skills
- apply effective research and organizational skills in preparing information
- plan and manage time
- refine understanding through discussion and explanation.
- tackle more complex problems than they could on their own.
- pool knowledge and skills.

Internal Assessment components:

Semester	Evaluation	Marks
III	Review of Literature and Analysis	50
IV	Report Submission and Viva-voce	50

Blue Print for End Semester Examination

Semester	Evaluation	Marks
IV	Project Report	50
IV	Viva-voce	50

M.Sc Mathematics
Semester IV
(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core XIII - Mathematical Methods	Course Code:17MM13
Semester: IV	No. of Credits: 4
No. of hours :90(Total hours)	C:T: S:63:12:15
CIA Max. Marks: 25	ESE Max. Marks:75

(C:Contact hours, T:Tutorial, S:Seminar)

Course Objectives:

The objectives of this course are

- to provide easy and effective means for solutions of integral equations arising in various fields of science and engineering.
- to solve differential and integral equations using integral transforms that are not solvable by standard methods
- to find extrema of functionals defined over a class of functions.

Syllabus:

Unit I:	**16 hrs**
Introduction: Definition,Regularity conditions, special kinds of Kernels – Eigen values and Eigen functions – Convolution Integral – The inner or scalar product of two functions. Integral Equations with Seperable kernels: Reduction to a system of algebraic equations –	

Examples. Fredholm alternative – Examples – An approximate method. Method of successive Approximations: Iterative scheme – Examples – Volterra integral equations – Examples.

Book 1: Chapter 2 (Sections 2.1 – 2.5), Chapter 3 (Sections 3.1 – 3.4)

Unit II **15 hrs**

Applications to Ordinary Differential Equations: Initial value problems – Boundary value problems – Examples. Singular Integral Equations: The Abel integral equation – Examples. Integral Transform Methods: Laplace transform – Application to Volterra integral equations with convolution type kernals – Examples.

Book 1: Chapter 5 (Sections 5.1 – 5.3), Chapter 8 (Sections 8.1 – 8.2)

Chapter 9 (Sections 9.3-9.5)

***Unit III** **15 hrs**

Fourier transforms: Fourier transforms – Fourier cosine transforms – Fourier sine transforms- Fourier transform of derivatives. The calculation of the Fourier transforms of some simple functions – The Fourier transforms of rational functions – The convolution integral – Parseval's theorem for cosine and sine transforms.

Book 2: Chapter 2 (Sections 2.3-2.10)

Unit IV **16 hrs**

Hankel Transforms: Introduction – Elementary Properties of Hankel Transforms- The Hankel Inversion Theorem- Hankel Transforms of Derivatives of Functions- The Hankel Transforms of Some Elementary Functions- The Parseval Relation for Hankel Transforms- Relations Between Fourier and Hankel Transforms.

Book 2: Chapter 5 (Sections 5.1-5.7)

Unit V **16 hrs**

The Methods of Variations in Problems with Fixed Boundaries: Variations and its Properties-Euler equation – Functionals of the Form $\int_{x_0}^{x_1} F(x, y_1, y_2, \ldots y_n, y_1', y_2', \ldots y_n')dx$ – Functionals dependent on higher – order derivatives – Functionals dependent on the functions of several independent variables – Variational problems in parametric form.

Book 3 : Chapter 6 (Sections 1 – 6)

Books for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-II	Linear Integral Equations –Theory and Technique	RamP.Kanwal	Academic press, Inc 1971
III	The Use of Integral Transforms	Ian.N.Sneddon	Tata Mc-Graw Hill Publishing Company Ltd.
IV- V	Differential Equations and the	L.Elsgolts	MIR Publishers, second printing –

	Calculus of variations		1973.

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Integral Equations	L.I.G. Chambers	A Short Course, International Text book company Ltd., 1976
2	Calculus of Variations with Applications	A.S Gupta	Prentice Hall of India Private Ltd., New Delhi, 1997.

M.Sc Mathematics

Semester IV

(For the students admitted during the academic year 2017 – 2018 onwards)

Course: Core XIV– Functional Analysis	**Course Code:17MM14**
Semester: IV	**No. of Credits: 4**
No. of hours :90(Total hours)	**C:T: S: 63:12:15**
CIA Max. Marks: 25	**ESE Max. Marks:75**

(C: Contact hours, T: Tutorial, S: Seminar)

Course Objectives:

The objectives of this course are

- to give a foundation in Banach spaces, operators, finite dimension spectral theory and Banach algebras.
- to apply the knowledge of above concepts in various branches of pure and applied mathematics.
- to enable the students to establish a relationship between isolated mathematical theories pertaining to different branches with the concepts in functional analysis.

Syllabus:

Unit I:	**16 hrs**
Banach spaces: The definition and some examples- Continuous linear transformations – The Hahn - Banach theorem – The natural imbedding of N in N** - The open mapping theorem. Chapter 9(Sections 46 – 50)	

Unit II	**15 hrs**
Banach spaces: The conjugate of an operator. Hilbert spaces: The definition and some simple properties – Orthogonal complements – Orthonormal sets. Chapter 9(Section 51) Chapter 10(Sections 52 – 54)	

***Unit III**	**15 hrs**
Hilbert spaces: The conjugate space H* – The adjoint of an operator – Self - adjoint operators – Normal and Unitary operators – Projections. Chapter 10(Sections 55-59)	

Unit IV	**16 hrs**
Finite- Dimensional Spectral Theory: Matrices – Determinants and the Spectrum of an operator – The Spectral theorem Chapter 11(Sections 60-62)	

Unit V	**16 hrs**
General Preliminaries on Banach algebras: The definition and some examples – Regular and singular elements – Topological divisors of zero – The spectrum – The formula for the spectral radius. Chapter 12(Sections 64-68)	

Book for study:

Unit	Name of the Book	Authors	Publishers with Edition
I-V	Introduction to Topology and Modern Analysis	G.F.Simmons	TATA McGraw -Hill Education Private Ltd, Twenty fifth Reprint 2015

Books for Reference:

S.No.	Name of the Book	Authors	Publishers with Edition
1	Functional Analysis	Dr.D.Somasundaram	S.Viswanathan Pvt Ltd., 1994
2	Functional Analysis	B.V.Limaye	Wiley Eastern Limited, Second edition, 2004.
3	Functional Analysis with applications	A.H.Siddiqui	Tata McGraw Hill Publishing Co. Ltd., 2007.
4	Functional Analysis	M.Thamban Nair	Prentice Hall of India Pvt Ltd., 2002