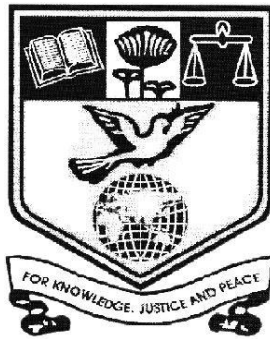# NEHRU MEMORIAL COLLEGE (Autonomous)
(Nationally accredited with A grade)
PUTHANAMPATTI

PG & RESEARCH DEPARTMENT OF MATHEMATICS

UG COURSE STRUCTURE & SYLLABI
(CBCS)
(For the candidates admitted from 2015-2016 onwards)

NEHRU MEMORIAL COLLEGE (Autonomous)
Under Graduate Programme Course Structure(CBCS)
(For the candidates admitted from 2015-2016 onwards)

PART	COURSES	NO. OF COURSES	NO. INST. HRS.	TOT. CREDITS	REMARKS
I	TAMIL	4	24	12	I-IV SEMESTER
II	ENGLISH	4	24	12	I-IV SEMESTER
III	MAJOR/CORE	14	78	64	I-VI SEMESTER
III	ELECTIVE	2	11	10	V, VI SEMESTER
III	ALLIED- I YR	3	14	12	I,II SEMESTER
	ALLIED- II YR	3	17	12	III, IV SEMESTER
IV	SKBC	2	4	4	SKBC 1 – II SEMESTER SKBC 2 – III SEMESTER
IV	NMEC	1	4	4	V SEMESTER
IV	COMPREHENSIVE COURSE	1	-	4	VI SEMESTER
IV	SOFT SKILL	1	-	4	IV SEMESTER
IV	GENDER STUDIES	1	-	1	III SEMESTER
IV	VALUE EDUCATION	1	2	1	I SEMESTER
IV	ENVIRONMENTAL STUDIES	1	2	1	II SEMESTER
V	EXTN. ACTIVITIES	1	-	1	-
	TOTAL	**39**	**180**	**140**	

NEHRU MEMORIAL COLLEGE (Autonomous)
Under Graduate Programme(Mathematics)-Course Structure CBCS
For the candidates admitted from 2015-2016 onwards

Sem	Part	Title of Course	Hrs / Week	Credits	Marks		
					Int (25)	Ext (75)	Total (100)
I	I	LC I Tamil I	6	3	25	75	100
	II	ELC I English I	6	3	25	75	100
	III	CC I	5	4	25	75	100
	III	CC II	4	4	25	75	100
	III	AC I	4	4	25	75	100
	III	AC II Lab	3	-	-	-	-
	IV	VE Value Education	2	1	-	100	100
	Total		**7 30**	**19**	125	475	600
II	I	LC II Tamil II	6	3	25	75	100
	II	ELC II English II	6	3	25	75	100
	III	CC III	7	5	25	75	100
	III	AC II Lab	3	4	25	75	100
	IIIL	AC III	4	4	25	75	100
	IV	ES Environmental Science	2	1	-	100	100
	IV	SKBC I	2	2	-	100	100
	Total		**7 30**	**22**	125	575	700
III	I	LC III Tamil III	6	3	25	75	100
	II	ELC III English III	6	3	25	75	100
	III	CC IV	5	5	25	75	100
	III	AC IV	6	4	25	75	100
	III	AC V	5	4	25	75	100
	IV	SKBC II	2	2	-	100	100
	IV	GS Gender Studies	---	1	-	100	100
	Total		**7 30**	**22**	**125**	**575**	700
IV	I	LC IV Tamil IV	6	3	25	75	100
	II	ELC IV English IV	6	3	25	75	100
	III	CC V	6	5	25	75	100
	III	CC VI	6	5	25	75	100
	III	AC VI	6	4	25	75	100
	IV	SS Soft Skill	---	2	-	100	100
	Total		**6 30**	**22**	125	475	600
V	III	CC VII	5	5	25	75	100
	III	CC VIII	5	5	25	75	100
	III	CC IX (T/L)	6	4	25	75	100
	III	CC X	5	4	25	75	100
	III	EC I	5	5	25	75	100
	IV	NMEC	4	4	-	100	100
	Total		**6 30**	**27**	125	475	600
VI	III	CC XI	6	5	25	75	100
	III	CC XII	6	4	25	75	100
	III	CC XIII	6	5	25	75	100
	III	CC IV	6	4	25	75	100
	III	EC II	6	5	25	75	100
	IV	CH Comprehensive	---	4	-	100	100
	Total		**6 30**	**27**	125	475	600
	V	Extension Activities		1			
	TOTAL		**180**	**140**	750	3050	3800

NEHRU MEMORIAL COLLEGE (Autonomous)
Under Graduate Programme (Mathematics)-Course Structure CBCS
For the candidates admitted from 2015-2016 onwards

Sem	Code	Part	Title of Course	Hrs/Wk	Cr	Marks		
						Int	Ext	Tot
I	15T101	I	LC I -Tamil I	6	3	25	75	100
	15H101	II	ELC II-English I	6	3	25	75	100
	15M101	III	CC I- Calculus	5	4	25	75	100
	15M102	III	CC II-Trigonometry and Algebra	4	4	25	75	100
	15M103A	III	AC I- Allied Physics- I	4	4	25	75	100
	15M104L	III	AC II –Allied Physics Lab*	3	-	-	-	-
	15VED	IV	VE Value Education	2	1	-	100	100
		Total	**7**	**30**	**19**	125	475	600
II	15T202	I	LC II -Tamil II	6	3	25	75	100
	15H202	II	ELC II -English II	6	3	25	75	100
	15M205	III	CC III Differential Equations, Applications and Laplace Transforms	7	5	25	75	100
	15M104L	III	AC II – Physics Lab*	3	4	25	75	100
	15M206A	III	AC III- Allied Physics- II	4	4	25	75	100
	15EVS	IV	ES Environmental Science	2	1	-	100	100
	15XM21L	IV	SKBC I- MS Office	2	2	-	100	100
		Total	**7**	**30**	**22**	125	575	700
III	15T303	I	LC III-Tamil III	6	3	25	75	100
	15H303	II	ELC III-English III	6	3	25	75	100
	15M307	III	CC IV- Analytical Geometry & Summation of Series	5	5	25	75	100
	15M308A	III	AC IV- Probability and Statistics I	6	4	25	75	100
	15M309A	III	AC V - Probability & Statistics II	5	4	25	75	100
	15XM32L	IV	SKBC II – SCILAB	2	2	-	100	100
	15GS	IV	GS Gender Studies	---	1	-	100	100
		Total	**7**	**30**	**22**	125	575	700
IV	15T404	I	LC IV-Tamil IV	6	3	25	75	100
	15H404	II	ELC IV-English IV	6	3	25	75	100
	15M410	III	CC V -Vector Calculus, Fourier Series &Fourier Transforms	6	5	25	75	100
	15M411	III	CC VI – Real Analysis I	6	5	25	75	100
	15M412AL	III	AC VI - R Programming Lab	6	4	25	75	100
	15SSC	IV	SS- Soft Skill Course	---	2	-	100	100
		Total	**6**	**30**	**22**	125	475	600
V	15M513	III	CC VII- Modern Algebra	5	5	25	75	100
	15M514	III	CC VIII- Real Analysis II	5	5	25	75	100
	15M515	III	CC IX Graph Theory	6	4	25	75	100
	15M516	III	CC X- Discrete Mathematics	5	4	25	75	100
	15M517*	III	EC I	5	5	25	75	100
	15M5N	IV	NMEC: Quantitative Aptitude	4	4	-	100	100
		Total	**6**	**30**	**27**	125	475	600
VI	15M618	III	CC XI – Complex Analysis	6	5	25	75	100
	15M619	III	CC XII- Mechanics	6	4	25	75	100
	15M620	III	CC XIII- Number Theory	6	5	25	75	100
	15M621 T/L	III	CC IV (T/L) – Programming in JAVA with Lab	6	4	25	75	100
	15M622*	III	EC II	6	5	25	75	100
	15MC	IV	CH -Comprehensive Course	---	4	-	100	100
		Total	**6**	**30**	**27**	125	475	600
		V	EA Extension Activities		1			
TOTAL				**180**	**140**	**750**	**3050**	**3800**

*EC   Electives:

Sem	Code	Course
V	**15M517b**	**Fuzzy Theory**
	15M517a	**Numerical Methods**
VI	**15M622c**	**Astronomy**
	15M622b	**Mathematical Modeling**
	15M622a	**Operations Research**

SYLLABUS REVISION 2014-2015

Department   : **MATHEMATICS**

Academic Programme offered   : **B.Sc.**

Year of Implementation   : **2015-2016**

OBE ELEMENTS

Programme Educational Objectives (PEO)

PEO 1: To qualify the students to become successful professionals by demonstrating logical and analytical thinking abilities.

PEO 2: To provide knowledge in the breadth and depth of mathematics, including the connections between different areas of mathematics.

PEO 3: Gain experience investigating the real world problems and learn how to apply mathematical ideas and models to those problems.

PEO 4: Analyze the use of computer technology to solve problems and to promote understanding.

Program Outcome (PO)

PO 1: Become knowledgeable in the subject of Mathematics and apply the principles of the same to the needs of the Employer/Institution/Enterprise/Society.

PO 2: Gain analytical skills in the field of Mathematics

PO 3: Understand and appreciate professional ethics, community living and Nation Building initiatives.

PO 4: To develop important analytical and logical skills and problem solving strategies to assess a broad range of issues in real life.

PO 5: To expose a wide range of modern mathematical ideas from pure and applied mathematics to graduate with both technical and quantitative skills that are in demand in the modern world.

PO 6: To acquire mathematical knowledge and understanding in advanced areas of mathematics from the given courses that provides a solid foundation for future learning.

Programme Specific Outcome (PSO)

PSO 1: Apply the knowledge of Mathematics in the domain of Science, Engineering and Technology

PSO 2: Solve the complex problems in the field of mathematics with an understanding of the societal, legal and cultural impacts of the solution.

PSO 3: Familiar with a variety of examples where mathematics helps accurately explain abstract or physical phenomena.

PSO 4 : Able to independently read mathematical literature of various types, including survey articles, scholarly books, and online sources.

PSO 5 : Life-long learners who are able to independently expand their mathematical expertise when needed, or for interest's sake.

PSO 6 : Recognize the importance and value of mathematical and statistical thinking, training and approach to problem solving, on a diverse variety of disciplines.

Course Code & Title	**15M101** **CCI - Calculus**		**Percentage of Revision : 5%**
I B.Sc. Mathematics	**Semester : I**	**Credits : 4**	**Hrs/ Wk : 5**
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • have a greater understanding of the basic concepts of differential and integral calculus. • enable the students to gain the ability to solve the problems related to multiple integrals, Beta and Gamma functions.		
Employability and Skill Development	**Global Need**	**Participative Learning, Problem solving**	

UNIT	Content	No. of Hours
I	**Successive Differentiation** Calculation of the nth derivative – Determination of nth derivative of rational function – The nth derivative of the product of the powers of Sines and Cosines – Leibnitz's theorem – Maxima and minima of the functions of two variables – Concavity and points of inflexion.	15
II	**Curvature and Evolutes** Curvature – Length of arc as a function – Radius of curvature – Evolutes and involutes.	15
III	**Reduction Formulae** Reduction Formulae – Integration of $\sin^n x$, $\cos^n x$ where n is a positive integer – Integration of $\sin^p x$, $\cos^q x$ where p and q are positive integers.	15
IV	**Multiple Integrals** Multiple Integral – Double Integrals – Change of order of Integration – Triple Integrals.	15
V	**Beta and Gamma functions** Beta and Gamma functions – Properties of Beta functions – Relation between Beta and Gamma functions – Evaluation of the Integrals using Beta and Gamma functions.	15
Reference	**Text Books:** 1. Shanthi Narayan and P.K. Mittal, Differential Calculus, S. Chand and Company LTD, 2012. Unit I : Ch 5 (5.2- 5.5),Ch9 (9.6), Ch 13 (5.2-5.5) Unit II : Ch 14 (Sec: 14.1 - 14.3, 14.7) 2. Shanthi Narayan and P.K. Mittal, Integral Calculus, S. Chand & Company LTD, 2012.	

	Unit III : Ch 2 (2.8),Ch 4 (4.1 – 4.3) Unit IV : Ch 12 (12.1, 12.2, 12.4, 12.6) 3. T.K. Manicavachagompillay and T. Natarajan, Calculus, Vol II, S.V. Publishers, 2012. Unit V : Ch 7(2-5) **Reference Books:** 1. George B. Thomas and Ross L. Finney, Calculus and Analytical Geometry, Sixth Edition, Narosa Publishing House, 1998. 2. T.K. ManicavachagomPillay and T. Natarajan, Calculus, Vol I, S. Viswanathan Printers and publishers Pvt. Ltd., 2012.
Course Outcomes	On completion of the course, students should be able to CO 1: acquire the concept of successive differentiation, maxima and minima of functions of two variables. CO 2: apply the concepts of Beta and Gamma functions to multiple integrals. CO 3: use reduction formula to evaluate integrals. CO 4: evaluate radius of curvature, evolutes and involutes.

Course Code & Title	15M102 CCII – Trigonometry and Algebra		Percentage of Revision : 60%
I B.Sc. Mathematics	Semester : I	Credits : 4	Hrs/ Wk : 4
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • enable the students to gain the knowledge of circular function, hyperbolic function and basic concepts of classical algebra.		
Employability and Skill Development	Global Need		Problem Solving

UNIT	Content	No. of Hours
I	**Expansions** Expansions for sinnθ and cosnθ-Expansion for tannθ, Expansion for $\cos^n\theta$ and $\sin^n\theta$ in terms of multiple angles of θ -Expansion of sinθ and cosθ in ascending powers of θ.	12
II	**Hyperbolic and Logarithmic functions** Hyperbolic functions-Invers Hyperbolic functions –Logarithms of complex numbers-Real and Imaginary parts of $\log(x+iy)$ – Logarithm of a negative real number.	12
III	**Theory of Equations** Relation between the roots and coefficients – Symmetric functions of the roots – Sum of the rth powers of the roots – Transformations of equations – Reciprocal equations – Decreasing and increasing the roots by a constant – Removal of terms.	12
IV	**Matrices** Consistency – Eigen values and Eigen vectors – Similar matrices – Cayley Hamilton theorem(statement only) - Symmetric, Skew Symmetric, Orthogonal, Hermitian, Skew Hermitian and Unitary matrices(simple problems).	12
V	**Inequalities** Elementary principles – Geometric and Arithmetic means – Wierstrass' Inequality – Cauchy's Inequality.	12

Reference	**Text Books:**
	   1. P.R.Vittal, Trigonometry, Markham Publication, 1998.
	Unit I : Ch 5 , Unit II :Ch 7, 8 (8.1 - 8.3)
	   2. T.K.ManicavachagomPillay, T.Natarajan, K.S.Ganapathy, Algebra, Volume I S.Viswanathan Printers and Publishers Pvt.Ltd, 2010.
	   Unit III :Ch 6 (6.11 - 6.16)
	   3. T.K.ManicavachagomPillay, T.Natarajan, K.S.Ganapathy, Algebra, volume II S.Viswanathan Printers and Publishers Pvt.Ltd-2010.	

	Unit IV :Ch 2(6.1-6.3, 9.1-9.6) , Unit V : Ch 4(1-5,9-11)
	Reference Books: 1. Hall and Knight , Higher Algebra, Fourth edition, Arihant Prakashan, 2012. 2. P.Kandasamy and K.Thilagavathy, Mathematics, Volume I, S.Chand and Company Ltd, 2010.
Course Outcomes	On completion of the course, students should be able to CO 1: acquire the knowledge of circular function. CO 2: give illustration of Eigen value and Eigen vector, symmetric, orthogonal and unitary matrix. CO 3: apply the concepts of theory of equations and inequalities.

Course Code & Title	**15M205** **CCIII – Differential Equations, Applications and Laplace Transforms**	**Percentage of Revision :** **10%**	
I B.Sc. Mathematics	**Semester : II**	**Credits : 5**	**Hrs/ Wk : 7**
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • enable the student to gain the ability to solve the problems related to first and higher order linear differential equation, partial differential equations and Laplace Transforms. • provide the applications of differential equations in various areas.		
Employability and Skill Development	**Global Need**	**Participative Learning, Problem Solving**	

UNIT	Content	No. of Hours
I	**First Order Ordinary Differential Equations** Exact Differential Equations – Integrating Factor – Necessary and Sufficient Condition (Without Derivative) – Equations Solvable for p, x & y and Clairauts Equation.	21
II	**Higher Order Linear Ordinary DifferentialEquations** Linear Differential Equations with Constant Coefficients and Linear Differential Equations with Variable Coefficients – Linear Equations Reducible to Homogeneous Linear Form – Variation of Parameters – Total Differential Equation – Condition of Integrability.	21
III	**Partial Differential Equations** Classification of Integrals – General, Particular, Complete and Singular Integrals – Formation of Partial Differential Equation – Four Standard Forms – Lagrange's Equation – Charpit's Method.	21
IV	**Second Order Partial Differential Equations and Applications of Differential Equations** Second order homogeneous partial differential equations with constant coefficients – Particular Integrals of $F(D,D)=f(x,y)$ where $f(x,y)=e^{ax+by}$, $\sin(ax+by)$, $\cos(ax+by)$ and $x^r.y^s$. Orthogonal Trajectories – Growth and Decay – Continuous Compound Interest – Falling Bodies – Simple Harmonic Motion.	21
V	**Laplace Transforms** Definition of Laplace Transform – Laplace Transform of Standard Functions – Inverse Transforms – Solution of Ordinary Differential Equations and Simultaneous Equations – Convolution Theorem.	21

Reference	**Text Books:** 1. S. Narayanan and T.K. ManicavchagomPillay, Differential Equations and its Application, S.V. Publications, 2012. Unit I:Ch 2(6.1 – 6.3) &Ch 4; Unit II: Ch 5 (1 – 6) &Ch 11 ; Unit III: Ch 12 (2,3,4,5.1-5.4,6) Unit V: Ch 9 2. S. Arumugam and A. Thangapandi Isaac, Differential Equations anditsApplications ,New Gamma Publication, 2011. Unit IV: Ch 5,6 (6.1-6.3,6.7,6.8) 3. H. K. Dass, Advanced Engineering Mathematics, S. Chand Publications, 2009. Unit IV: Ch 9 (9.10-9.12) **Reference Books:** 1. S. Sangarappan, S. Kalavathy, Differential equations and Laplace Transforms, Vijay Nicole imprints private Ltd, Chennai, 2005. 2. P.R. Vittal, Differential Equations and Laplace Transforms, Margham Publication, 2004. 3. P. Kandasamy, K. Thilagavathy and K. Gunavathy, Engineering Mathematics, S. Chand and Company, 1997.
Course Outcomes	On completion of the course, students should be able to CO 1: acquire the knowledge of the first order ODE, PDE and Laplace Transforms. CO 2: solve the problems choosing the most suitable method. CO 3: model the real world scenario using ODE, PDE. CO 4: sense the essential difference between ODE and PDE.

Course Code & Title	15XM21L SKBC I – MS Office	Percentage of Revision : NIL	
I B.Sc. Mathematics	Semester : II	Credits : 2	Hrs/ Wk : 2
Cognitive Level	K – 1 – Acquire K – 2 – Understanding K – 3 – Apply K – 4 – Evaluate K – 5 – Analyze		
Course Objectives	The Course aims to • learn and practice MS Office.		
Skill Development	Global Need	Experiential Learning	

UNIT	Content	No. of Hours
I	**MS WORD** • Paragraph Formatting • Newspaper Style Document • Creation • Mail Merge • Page Formatting and Printing	10
II	**MS EXCEL** • Worksheet • Including Formulas • Formatting Cells • Chart Creation • Functions	10
III	**MSPOWERPOINT** • Creating Presentation • Sound Animations • Inserting Picture	10
Reference	**Text Books:** S. S. Shrivastava, MS – Office, Mittal Books India, 2015. **Reference Books:** 1. S. Jain, MS – Office 2007 Training Guide, BPB Publications, 2010. 2. Dinesh Maidasani, Learning Computer Fund, MS Office and Internet & Web Technology, Fire Wall Media, 2015.	
Course Outcomes	On completion of the course, students should be able to CO 1: gain the basic knowledge of Microsoft Office. CO 2: understand the ethical issues in saving word processing documents. CO 3: apply designs to enhance the looks of the presentation. CO 4: analyze the use of Microsoft word, Excel and PowerPoint.	

Course Code & Title	15M307 CCIV – Analytical Geometry & Summation of Series		Percentage of Revision : 60%	
II B.Sc. Mathematics	Semester : III		Credits : 5	Hrs/ Wk : 5
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze			
Course Objectives	**The Course aims to** • enable the student to gain fundamental ideas about co-ordinate geometry and gives clear knowledge about regular geometrical aspects and their properties in two dimensional and three dimensional analytical geometry and basic skills in the areas of summation series.			
Employability and Skill Development	Global Need		Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	**Plane** The general equation of a plane – Intercepts form – Normal form – The equations of the plane passing through the three points – Direction cosines of the line which is perpendicular to a plane – angle between the planes – Equation of a plane through the line of intersection of two given planes – Length of perpendicular – The equation of the planes bisecting the angle between the two planes.	15
II	**Straight Line** Intersection of the two planes – symmetrical form of the equation of a line – Equation of a straight line passing through two given points – the plane and straight line – angle between the plane and the line – Coplanar lines – The Shortest distance between two given line – The intersection of the three planes – Volume of tetrahedron.	15
III	**The Sphere** Definition – The equation of a sphere –length of the tangent – the plane section of a sphere is a circle – Equation of a circle on a sphere – Equation of a sphere passing through a given circle – Intersection of two sphere is a circle – the equation of the tangent plane.	15
IV	**Binomial, Exponential and Logarithmic Series** Binomial theorem for a rational index – Application to summation of series – approximate values – Exponential and logarithmic theorems(without proof) – Applications to summation of series.	15

V	**Summation of Series** Summation of series – Applications of partial fractions – Summation by difference series – Recurring Series.	15

Reference	**Text Books:**
	
	1. T. K. ManicavachagomPillay, T. Natrajan, A text book of Analytical Geometry, Part II – Three dimensions, S.Viswanathan (Printers & Publishers) Pvt.Ltd., 2010.
	   Unit I : Ch 2 (1-11) Unit II: Ch 3 (1-8,10,11) Unit III: Ch 4(1-8)
	2. T. K. ManicavachagomPillay, T. Natrajan, K.S. Ganapathy, Algebra, Volume I, S.Viswanathan (Printers & Publishers) Pvt.Ltd., 2010.
	   Unit IV : Ch 3 (5,6,10,11),Ch 4(2,3,5,7,9,11) Unit V: Ch 5 (1-7)
	Reference Books:
	1. SL Loney, The elements of coordinate geometry, Cartesian coordinates, Part I, 2012.
	2. Hall & Knight, Higher Algebra, Fourth edition, Arihant Prakashan, 2012.
	3. P. Kandasamy and K. Thilagavathy, Mathematics, Vol. I,S. Chand & Company LTD, 2010.	

Course Outcomes	On completion of the course, students should be able to CO 1: recollect the basic concept of equation of a plane, straight line the sphere and binomial, exponential and logarithmic series. CO 2: understanding about the concept of forming a plane of a equation and to find angle between the plane and line, co-planer lines, volume of tetrahedron. CO 3: get the clear Idea to form a equation of a sphere passing through a given circle, intersection of two spheres is a circle and the equation of the tangent plane. CO 4: demonstrate the binomial theorem for a rational index, applications summation of series and recurring series.	

Course Code & Title	15M308A ACIV – Probability & Statistics I	Percentage of Revision : NIL	
II B.Sc. Mathematics	Semester : III	Credits : 4	Hrs/ Wk : 6
Cognitive Level	**K – 1** – Acquire **K – 2** – Understanding **K – 3** – Apply **K – 4** – Evaluate **K – 5** – Analyze		
Course Objectives	**The Course aims to** • acquire the basic concepts of discrete and continuous random variable, expectations and distributions.		
Employability and Entrepreneurship	**Global Need**	**Participative Learning, Problem Solving**	

UNIT	Content	No. of Hours
I	**Bayes' theorem and Random variables** Classical definition of Probability – Addition theorem – Axioms of probability – Conditional probability – Bayes' theorem – Random Variables - Discrete and continuous random variables – Cumulative distribution – Properties of distribution function – Two dimensional random variable – Marginal probability distribution – Conditional probability distribution – Independent random variables.	18
II	**Mathematical Expectation and Variance** Expectation – Expectation of function of a random variable – Properties of expected value – Variance mean deviation – Tchebechev's inequality – Conditional expectation.	18
III	**Moments, Moment generating functions and Characteristic functions** Central moments – Moments about origin – Moment generating function – Characteristic function – Probability generating function – Cumulates.	18
IV	**Discrete probability distributions** Binomial, Poisson, Negative Binomial, Hyper geometric and Geometric distributions.	18
V	**Continuous Distributions** Normal, Uniform distribution, Exponential, Gamma and Beta distribution.	18
Reference	**Text Books:** P.R. Vittal, Mathematical Statistics, Margham publication, 2012. Unit1: Ch 2 Unit2: Ch (3, 4, 7) Unit3: Ch (5, 6) Unit4: Ch (12 – 15) Unit5: Ch (16 – 20)	

	Reference Books: **1.** S. C. Gupta and V.K.Kapoor, Fundamental of Mathematical statistics, S. Chand and sons, 11th edition, 2010. 2. S. C. Gupta, Fundamental of Mathematical statistics, Himalaya publishing company, 7th Revised & Enlarged edition, 2014. 3. S. P. Gupta, statistical methods, Sultan Chand and co., 1997.
Course Outcomes	On completion of the course, students should be able to CO 1: gain the knowledge of variable and probability distributions. CO 2: understand the basic concepts of discrete and continuous distributions and their properties. CO 3: apply the various distributions suitably to real life problems CO 4: compute expectations, variations and other higher order moments of the distributions.

Course Code & Title	15M309A ACV – Probability & Statistics II		Percentage of Revision: 50%
II B.Sc. Mathematics	Semester : III	Credits : 4	Hrs/ Wk : 5
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • introduce various methods of statistical inference.		
Employability and Entrepreneurship	Global Need		Participative Learning, Problem Solving

UNIT	Content	No. of Hours
I	**Correlation** Sample correlation – Ranks correlation – Properties of correlation coefficient – Limitations – Method of calculating Correlation Coefficient – Merit and Demrit.	15
II	**Regression and Curve Fitting** Derivation of regression lines – Properties of Regression Coefficient – Principle of Least Squares – Fitting a Straight line – Fitting a Second Degree Polynomial – Fitting a Curve of the form $y = ae^{bx}$- Fitting a Second Degree Polynomial – Fitting a Curve of the form $Y = ab^x$– Fitting a Second Degree Polynomial – Fitting a Curve of the form $y = ax^b$.	15
III	**Multiple and Partial Correlation, Functions of Random Variable** Equation of Regression Plane – Multiple Correlation Coefficient – Partial Correlation Coefficient - Expression for Standard Deviation in terms of Standard Deviation of lower order – Relation between Multiple and Partial Correlation Coefficient: Functions of Random Variable – Distribution Function Method – Product of Two Variables – Quotient of Two Variables.	15
IV	**Sampling Distributions** Sampling Distribution – Sampling Distribution of $\overline{X}$- Chi Square Distribution –MGF of χ^2 Distribution β, γ Coefficients – Characteristic function of χ^2 Distribution – Mode of χ^2 Distribution – Additive Properties of χ^2 Random Variable – t Distribution – Moments of t Distribution – Limiting form of t Distribution- F distribution – Derivation of the Distribution of $Z = \frac{1}{2}\log_e F$ – Moment of F Distribution.	15

V	**Estimation** Point Estimation – Estimate – Unbiased Estimation Efficiency – Cramer – Rao Inequality(statement only) – Rao-Black Well Theorem (statement only) – Consistent Estimator – Method of Maximum Likelihood Estimator – Properties of ML Estimator – Minimum Chi Square Estimator – Interval Estimation – Confidence Interval of the Mean of the Normal Population – Confidence for Proportion – Confidence Interval for the Difference between two Proportion(Simple problems only).	15
Reference	**Text Books:** P.R.Vittal, Mathematical Statistics, Margham Publication, 2012. Unit1: Ch 8 Unit2: Ch (9, 10) Unit3: Ch (11, 21) Unit4: Ch (22) Unit5: Ch (23) **Reference Books:** 1.S.C.Gupta and V.K.Kapoor, Fundamental of Mathematical Statistics, S.Chand& Sons, 11thEdition, 2010. 2. S.C.Gupta, Statistical Methods, Sultan Chand and Co.,1997.	
Course Outcomes	On completion of the course, students should be able to CO 1: acquire the knowledge of correlation, regression and sampling distributions. CO 2: understand the necessity of various techniques for robust statistical inference. CO 3: apply the concept of estimation to the parameter of sampling distributions. CO 4: evaluate expectation, variance, mgfs, characteristic functions and estimators.	

Course Code & Title	15XM32L SKBC II – SCILAB	Percentage of Revision : 100%	
II B.Sc. Mathematics	**Semester : III**	**Credits : 2**	**Hrs/ Wk : 2**
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • know about SCILAB • meet the global requirements in software industries.		
Skill Development	**Global Need**	**Experiential Learning**	

UNIT	Content	No. of Hours
	Exercises • Basic commands • Matrix manipulations • Determinants • Polynomials • Two dimensional Plots • Multiple plots • Sub plots • Three dimensional plots	30
Reference	**Text Books:** Michael Baudin, Introduction to SCILAB, The SCILAB Consortium, 2010. **Reference Books:** Gilberto E. Urroz, Programming with SCILAB, September 2002.	
Course Outcomes	On completion of the course, students should be able to CO 1: gain knowledge about implementation of simple mathematical functions, equations in numerical computing environment. CO 2: understand the need for simulation /implementation for the verification of mathematical functions. CO 3: apply simple mathematical functions and operations on using plots. CO 4: analyze various SCILAB command.	

Course Code & Title	15M410 CCV – Vector Calculus, Fourier Series & Transforms	Percentage of Revision : NIL	
II B.Sc. Mathematics	Semester : IV	Credits : 5	Hrs/ Wk : 6
Cognitive Level	K – 1 – Acquire K – 2 – Understanding K – 3 – Apply K – 4 – Evaluate K – 5 – Analyze		
Course Objectives	The Course aims to • provide the knowledge about Vector differentiation, Vector integration, Fourier series and Fourier transforms.		
Employability and Skill Development	Global Need	Participative Learning, Problem Solving	

UNIT	Content	No. of Hours
I	**Vector Differentiation** Introduction - Scalar and Vector point function – Gradient - Divergence and curl of a vector point function – Vector identities.	18
II	**Vector Integration** Introduction - Line, Surface and volume Integrals and their evaluation.	18
III	**Theorems on Vector Integration** Theorems of Gauss, Stoke's and Green's(statement only) - Problems using these three theorems.	18
IV	**Fourier series** Definition of Fourier series - Fourier series expansion of periodic function of period 2π and $2a$ – Odd and even function- Half range series - Change of interval.	18
V	**Fourier Transforms** Fourier Transforms - Integral formula - Fourier Integral theorem - Properties of Fourier Transforms – Cosine and Sine Transforms and their properties - Parsaval's identity - Convolution theorem.	18

Reference	**Text Books:**
	   1. P.R.Vittal, V.Malini, Vector Analysis, Margham Publication, 2003.
	   Unit I : Ch 1 ; Unit II : Ch 2 ; Unit III : Ch 2
	   2. S.Narayanan, T.K.Manicavachagompillay, Calculus, Volume 3, S.Viswanathan Publishers, 2013.
	   Unit IV : Ch 6 (6.1-6.6) ; Unit V : Ch 6 (6.9.1-6.9.15)	

	Reference Books:
	1. Jain and Iyengar, Advanced Engineering Mathematics, Second Edition, Narosa Publishing House, 2006.
	2. Murray R. Spiegel, Vector Analysis, MC Graw - Hill Book Company, 2009.
Course Outcomes	On completion of the course, students should be able to

CO 1: acquire the concept of the vector differentiation, vector integration, Fourier series and Fourier Transforms.
CO 2: understand the practical utility of gradient, divergent & curl.
CO 3: apply the divergence, curl and scalar potential to real life problems.
CO 4: evaluate the multiple integrals and Fourier series for periodic function and Fourier Transforms for a periodic functions. |

Course Code & Title	15M411 CC VI – Real Analysis I		Percentage of Revision : 100%
II B.Sc. Mathematics	Semester : IV	Credits : 5	Hrs/ Wk : 6
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • gain the basic knowledge of real analysis. • impart an in depth knowledge of functions, sequences, infinite series and limit of a function.		
Employability	Global Need	Participative Learning, Problem Solving	

UNIT	Content	No. of Hours
I	**Sets and Functions** Set and functions – Mathematical induction –Finite and Infinite sets –The algebraic and order properties of R-absolute value and real line.	18
II	**Properties of Real Numbers** The completeness property of R-Applications of supremum property –Intervals.	18
III	**Sequences** Sequence and their limits – Limit theorems – Monotone sequences –Sub sequences – Bolzano Weierstrass theorem – Cauchy criterion –Properly divergent sequences.	18
IV	**Infinite Series** Infinite series – Geometric series – Cauchy criterion for series – Harmonic series – Alternating harmonic – Comparison test – Limit comparison test – Cauchy condensation test and Robust test(statement only). Absolute convergence – Conditional convergence – Alternating series – Leibnitz's theorem(statement only).	18
V	**Limits** Limit of function – limit theorems – extension of limit concepts.	18
Reference	**Text Books:**	

	Robert G. Bartle, Donald R. Sherbert, Introduction to Real Analysis, 3rd Edition, Wiley Student Edition, 2007.
	Unit I : Ch 1 (1.1-1.3),Ch 2 (2.1,2.2)
	Unit II : Ch 2(2.3-2.5)
	Unit III :Ch 3(3.1-3.6)
	Unit IV :Ch 3(3.7)
	Unit V : Ch 4(4.1- 4.3)
	Reference Books:
	1. Kenneth A.Ross, Elementary analysis the theory of calculus, Springer international edition, 2007.
	2. M.K.Singal, Asha Rani Singal, A first course in real analysis, S. Chand & Co., 2003.
	3. Tom. M. Apostal, Mathematical Analysis, 2nd edition, arosa publishing house, 1974.
	4. Walter Rudin, Principles of Mathematical Analysis, 3rd Edition, McGraw Hill, 1976.
Course Outcomes	On completion of the course, students should be able to
	CO 1: acquire the knowledge of basic concepts of real analysis, sets, functions, mathematical induction and completeness property.
	CO 2: understand the concept of continuity, convergent sequence, sub sequence and divergent sequence.
	CO 3: apply the limit of various function.
	CO 4: analyze the extension of limit concepts.

Course Code & Title	15M412AL AC VI – R Programming Lab		Percentage of Revision : 100%
II B.Sc. Mathematics	Semester : IV	Credits : 4	Hrs/ Wk : 6
Cognitive Level	K – 1 – Acquire K – 2 – Understanding K – 3 – Apply K – 4 – Evaluate K – 5 – Analyze		
Course Objectives	**The Course aims to** • know all needed about R programming and also to meet the global requirement in software industries.		
Employability	Global Need		Experiential learning

UNIT	Content	No. of Hours
	Theory Introduction to R – Installation of R reading and getting data into R – types of Data items – The structure of Data Items – Working with objects – Descriptive statistics and tabulation – data distribution – Simple hypothesis testing – Graphical analysis – Formula notation and Complex statistics – Regression – Writing your own scripts.	12
	LAB Practical • Histograms and summary statistics • Scatter plots and correlations • Regression • Confidence intervals • Multiple regression • Group comparisons(t – tests, ANOVA, post-hoc tests) • Factorial ANOVA • Chi – square • Non – linear regression(Binary logistic and Poisson) • Estimation (parametric and Non – parametric)	78
Reference	**Text Books:** Paul Teetor, R Cook book, O'Reilly Publication, First Edition, 2014. **Reference Books:** Mark Gardener, Beginning R -The Statistical Programming Language, Wiley Publications, 2015.	
Course Outcomes	On completion of the course, students should be able to CO 1: gain knowledge about different data types and different data structures in R. CO 2: understand basic regular expressions in R. CO 3: apply the various graphics in R for data visualization. CO 4: analyze the uses of R for descriptive statistics and inferential statistics.	

Course Code & Title	15M513 CCVII – Modern Algebra		Percentage of Revision : 10%
III B.Sc. Mathematics	Semester : V	Credits : 5	Hrs/ Wk : 5
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • provide a first approach to the subject of algebra, which is one of the basic pillars of modern mathematics and an adequate foundation for further study in abstract algebra.		
Employability	**Global Need**		**Participative Learning, Problem Solving**

UNIT	Content	No. of Hours
I	**Groups and Subgroups** Definition of a group – Some Examples of groups – Some Preliminary Lemmas – Subgroups – A counting principle – Normal groups and Quotient groups.	15
II	**Homomorphisms and Automorphisms** Homomorphisms (Except applications) – Automorphisms – Cayley's theorem.	15
III	**Permutation groups and Rings** Permutation groups – Definition and examples of Rings – Some special classes of Rings – Homomorphisms.	15
IV	**Ideals and Vector Spaces** Ideal and Quotient Rings – More Ideals and Quotient Rings – Basics of Vector spaces – Linear Independence and Bases – Dual spaces.	15
V	**Inner product spaces and Linear Transformation** Inner product spaces – The Algebra of Linear transformations – Characteristic Roots.	15
Reference	**Text Books:** I.N. Herstein, Topics in Algebra, Wiley Student Edition, Second Edition, 2011. UnitI: Ch 2(2.1-2.6) Unit II: Ch 2 (2.7-2.9) Unit III: Ch 2(2.10), Ch 3 (3.1-3.3) Unit IV: Ch 3(3.4,3.5), Ch 4 (4.1-4.3) Unit V: Ch 4 (4.4), Ch 6(6.1,6.2) **Reference Books:** **1.** S. Kumaresan, Linear Algebra, a Geometric Approach, PH1 Learning Pvt. Ltd.,	

	2010.
	2. John. B. Fraleigh, A first course in Abstract Algebra, 7th Edition, 2002.
Course Outcomes	On completion of the course, students should be able to
	CO 1: gain the knowledge about concepts of sets, mapping, relations and use some basic definition of groups & subgroups.
	CO 2: understand the importance of algebraic properties with regard to working within various number systems.
	CO 3: apply the results from group theory to study the properties of rings and fields and to possess the ability to work within their algebraic structure.
	CO 4: analyze the concepts of homomorphism and isomorphism for groups, rings and field.

Course Code & Title	15M514 CCVIII – Real Analysis II		Percentage of Revision : 100%
III B.Sc. Mathematics	Semester : V	Credits : 5	Hrs/ Wk : 5
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • introduceadvancedconceptsin real analysis.		
Employability	Global Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	Continuous functions – Combination of continuous functions – Continuous functions on intervals – Uniform continuity.	15
II	Lipschitz functions – Monotone and inverse functions – Differentiation: The derivative – chain rule.	15
III	Inverse functions – The mean value theorem – Intermediate value theorem – Properties of derivatives – Darboux's theorem – Taylor's theorem – Application of Taylor's theorem – Relative Extrema – Convex functions.	15
IV	The Riemann Integral – Riemann integrable functions – The fundamental theorem.	15
V	Problems on sequence & series, Limits, continuity, differentiability and integrability.	15
Reference	**Text Books:** Robert, G. Bartle, Donald R. Sherbert, Introduction to Real Analysis, Third Edition. Unit I : Ch 5 (5.1 – 5.4.3) Unit II: Ch 5(5.4.4-5.4.6,5.6.1-5.6.5) ,Ch 6(6.1.1-6.1.7) Unit III: Ch 6(6.1.8-6.2.12,6.4.1-6.4.6) Unit IV : Ch 7(7.1-7.2) Unit V :Bank of Problems given separately **Reference Books:** 1. Kenneth A Ross, Elementary Analysis and the theory of calculus, Springer, International Edition, 2007. 2. M.K. Singal, Asha Rani Singal, A first course in Real Analysis, S. Chand & Co., 2003. 3. Tom. M. Apostal, Mathematical Analysis, Second Edition, Narosa Publishing house, 1974. 4. Shanthi Narayan, Elements of Real Analysis, S. Chand and company Ltd, 2007	

	(unit4)
	5. Walter Rudin, Principles of Mathematical Analysis, Third Edition, MC. Graw Hill, 1976.
Course Outcomes	On completion of the course, students should be able to
	CO 1: gain knowledge about the basic properties of Riemann integral.
	CO 2: understand the differentiability of real functions and its related theorems.
	CO 3: apply chain rule and inverse function.
	CO 4: evaluate the properties of derivatives.
	CO 5: analyze the methods in real analysis can be applied in important practical problems.

Course Code & Title	15M515 CC IX – Graph Theory		Percentage of Revision : 20%
III B.Sc. Mathematics	Semester : V	Credits : 4	Hrs/ Wk : 6
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • introduce the basic concept of Graph Theory and enable the students to learn about the essentials of Graph Theory.		
Employability	Global Need		Participative Learning, Problem Solving

UNIT	Content	No. of Hours
I	**Introduction** Definition of Graph – Edge Sequences, Walks, Paths and Circuits – Digraphs – Subgraphs and Operations on Graphs – Isomorphism of Graphs – Connected graphs – Euler graphs – Hamiltonian Circuits and paths – Planar graph – Petersen graph.	18
II	**Trees** Properties – Special Classes – Spanning Trees – Minimal Spanning Trees – Travelling Salesman problem.	18
III	**Cut – Set Theory and Matrix Representation** Cut sets – Properties – Fundamental circuits and cut set – Incidence Matrix – Sub Matrix – Sub Matrices – Circuit Matrix – Fundamental Circuit Matrix – Cut –set Matrix – Path Matrix.	18
IV	**Colouring, Covering and Partitioning** Chromatic Number – Chromatic Partitioning – Chromatic Polynomial – Matching – covering – The Four color problem.	18
V	**Applications** Graphs as Models – Applications of Coloring – Shortest path problem – Transport Networks – Topological Sorting – De Brujin sequence and De Brujin Digraphs.	18
Reference	**Text Books:** 1. N. Chandrasekaran, M. Umaparvathi, Discrete Mathematics, PHI Learning Pvt.Ltd., New Delhi, 2010. Unit I: Ch 1(1.11) Ch 10(10.1-10.6) Unit II: Ch 11(11.1-11.5) Unit V: Ch 10(10.9.1-10.9.6) 2. NarasinghDeo, Graph Theory with Applications to Engineering and Computer Science, PHI of India, New Delhi, 2005. Unit III: Ch 4(4.1-4.4) Ch 7(7.1-7.4,7.6,7.8) Unit IV: Ch 8(8.1-8.6) **Reference Books:** **1.**K.R.Parthasarathy, Basic Graph Theory, Tata Mc. Graw- Hill Publishing Co. Ltd., New Delhi, 1994.	

	2. Douglas B. West, Introduction to Graph Theory, PHI Pvt., Ltd., New Delhi, II Edition, 2006.
Course Outcomes	On completion of the course, students should be able to CO 1: acquire the knowledge of the fundamental concepts in graph theory. CO 2: understand the concept of cut points, bridges and blocks. CO 3: apply the concept of Eulerian graph and Hamiltonian graph. CO 4: evaluate the problems involving vertex connectivity and edge connectivity.

Course Code & Title	15M516 CC X – Discrete Mathematics		Percentage of Revision : NIL
III B.Sc. Mathematics	Semester : V	Credits : 4	Hrs/ Wk : 5
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • direct the students to get clear thinking, sound reasoning and a proper attitude towards the applications of mathematics in computer science and other related fields.		
Employability and Skill Development	Global Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	**Propositional Calculus** Statement and Notation – connectives and Truth tables – Normal forms – theory of Inference for statement – Calculus.	15
II	**Predicate Calculus** Introduction Inference – Theory of Predicate Calculus – Nested Quantifiers – Proof Techniques.	15
III	**Lattices** Definition and examples – Properties of Lattices – Lattices as Algebraic Systems – Sublattices and Lattice – Isomorphism – Special classes of Lattices – Distributive Lattices.	15
IV	**Boolean Algebra** Definitions – Boolean Algebra as Lattice and Algebraic System – Properties – Subalgebra and Homomorphisms of Boolean Algebras – Boolean Functions.	15
V	**Combinatorics** Permutations – Combinations – Permutations with Repetitions – Combinations with repetition – Permutations of sets with Indistinguishable Objects – Miscellaneous Problems on Permutations and Combinations – Binomial Identities and Binomial Theorem.	15
Reference	**Text Books:** 1. S. Santha, Discrete Mathematics, Cengage Learning, India Pvt. Ltd., 2011. Unit I: Ch 1(1.1 - 1.5) Unit II: Ch 2(2.1 – 2.4) 2. N. Chandrasekaran, M. Umaparvathi, Discrete Mathematics, PHI Learning	

	Pvt. Ltd., New Delhi, 2010. Unit III: Ch 8(8.1 – 8.6) Unit IV: Ch 9(9.1 – 9.5) Unit V: Ch 3(3.1-3.7) **Reference Books:** 1. J. P. Trembley, R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw – Hill Publishing Co.Ltd., New Delhi, 2007. 2. Ralph P. Grimaldi, B. V. Ramana, Discrete and Combinatorial Mathematics (An Applied Introduction), Pearson, 5th edition, 2007.
Course Outcomes	On completion of the course, students should be able to CO 1: acquire knowledge to write an argument using logical notation. CO 2: understand the basic principles of sets and operations in sets. CO 3: apply the rules of inference and methods of proof including direct and indirect proof form, proof by contradiction and mathematical induction. CO 4: evaluate Boolean functions and simplify expression using the properties of Boolean Algebra.

Course Code & Title	15M517b EC I – Fuzzy Theory	Percentage of Revision : NIL	
III B.Sc. Mathematics	Semester : V	Credits : 5	Hrs/ Wk : 5
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • gain the knowledge about Vector differentiation, Vector integration, Fourier series and Fourier transforms.		
Employability	**National Need**	**Participative Learning, Problem solving**	

UNIT	Content	No. of Hours
I	Definitions-Different types of fuzzy sets- Properties of fuzzy sets-Operations in fuzzy sets -General properties of fuzzy Vs crisp.	15
II	Introduction - Important theorems- Extension principle for fuzzy sets-Fuzzy compliments-Further operations on Fuzzy sets.	15
III	Introduction-Projection and cylindrical fuzzy relations-Composition-Properties of Min-Max compositions-Binary relations on a single set.	15
IV	Introduction-Fuzzy measures-Evidence theory probability measure-possibility and necessity measures.	15
V	Introduction-individual decision making-multiperson decision making-multi-criteria decision making-Fuzzy ranking method.	15
Reference	**Text Books:** Pundir and Pundir, Fuzzy sets and their applications, A Pragati Edition, 2006. Unit I : Ch 1 (1.16-1.19) Unit II : Ch 2 (2.1-2.5) Unit III : Ch4 (4.1-4.5) Unit IV : Ch 5 (5.1-5.5) Unit V : Ch9(9.1- 9.5) **Reference Books:** George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic Theory and Applications, PHI, New Delhi, 2002.	
Course Outcomes	On completion of the course, students should be able to CO 1: gain the methods of fuzzy logic (or) recognize fuzzy logic membership function acquires knowledge of important pats of fuzzy set theory. CO 2: understand the basic mathematical elements of the theory of fuzzy sets CO 3: apply the rules of fuzzy logic for fuzzy control. CO 4: evaluate fuzzy statistics applications.	

Course Code & Title	15M517a EC I – Numerical Methods	Percentage of Revision : 5%	
III B.Sc. Mathematics	Semester : V	Credits : 5	Hrs/ Wk : 5
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • provide the knowledge with Numerical Methods of solving the non-linear equations, Interpolation, Differentiation and Integration.		
Employability and Skill Development	**Global Need**	**Participative**	**Learning,** **Problem Solving**

UNIT	Content	No. of Hours
I	Iterative methods: Bisection method – False position method – Newton Raphson method – Solution of simultaneous Linear Algebraic equations – Gauss Elimination, Gauss-Jordan, Gauss-Jacobi & Gauss-Seidel iterative methods.	15
II	Definition: Forward and Backward differences – Newton's formula for interpolation Operators – Properties and relationship among them – Missing terms & summation of series – Montmort's theorem.	15
III	Divided differences – Newton's interpolation formula for unequal intervals – Lagranges' interpolation formula – Inverse interpolation.	15
IV	Numerical Differentiation and Integration – Trapezoidal rule – Simpson's one-third rule – Simpson's three-eight rule – Difference Equations and Method of Solving – The Cubic Spline method.(Problems only)	15
V	Taylor's series – Picard's method of successive approximation – Euler's method – Modified Euler Method – Runge-Kutta method – Predictor-Corrector methods – Milne's and Adam'sBashforth methods. (Problems only)	15
Reference	**Text Books:** P.Kandasamy, K.Thilagavathy, K.Gunavathi, Numerical Methods, S.Chand Company Ltd, 2005. Unit I :Ch 3(3.1 – 3.4) , Ch 4(4.1,4.2,4.7-4.9) Unit II :Ch 5(5.1 – 5.4) Unit III :Ch 8(8.1 – 8.5,8.7) Unit IV :Ch 9(9.1 – 9.3,9.7-9.9,9.13-9.14), Ch 10 Unit V: Ch 11(11.5,11.8,11.9,11.11 – 11.13,11.16-11.18)	

	Reference Books: **1.** S.Narayanan, S.Viswanathan, Numerical Analysis, 1994. 2. M.K.Jain, S.R.K.Iyengar, R.K.Jain, Numerical Methods for Scientific and Engineering Computation, Wiley Eastern Limited, New Delhi, 1985.
Course Outcomes	On completion of the course, students should be able to CO 1: gain the knowledge of solving an algebraic or transcendental equation using an appropriate Numerical Methods. CO 2: understand the mathematics concepts underlying the Numerical Methods. CO 3: apply Numerical Methods to obtain approximate solutions to mathematical problems. CO 4: evaluate a derivative at a value using an appropriate Numerical Method

Course Code & Title	15M5N NMEC – Quantitative Aptitude	Percentage of Revision : NIL	
III Year (Except B.Sc Maths)	Semester : V	Credits : 4	Hrs/ Wk : 4
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** learn basic Mathematical skills for solving problems in competitive examinations.		
Employability and Skill Development	Regional Need	Problem solving	

UNIT	Content	No. of Hours
I	Arithmetic Progression – Geometric Progression – Simple interest – Types of annuities – Present value and amount of annuity.	12
II	Ratio – Proportion – Partnership	12
III	Percentage – Mixture – Profit and Loss	12
IV	Time and Work, Time and Distance, Work and Wage	12
V	Pipes and Cisterns – Permutations and Combinations.	12
Reference	**Text Books:** 1. P. Navaneethan, Business Mathematics, Jai Publishers, Trichy, 2012. Unit I: Ch 4 & 5 2. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand and Co, 7th Revised Edition, 2007. Unit II: Ch 10,11 Unit III: Ch 12,13,20 Unit IV: Ch 15,17 Unit V: Ch 16,30 **Reference Books:** 1. AshishAggarwal, Quick Arithmetic, S. Chand, 2005. **2.** P. N. Arora, Business Mathematics, Allied Publishers, 1985.	
Course Outcomes	On completion of the course, students should be able to CO 1: acquire the knowledge in Arithmetic and Geometric progression . CO 2: understand the ratio, proportion and partnership. CO 3: evaluate permutation and combination . CO 4: apply the concepts of profit & loss in real life problems.	

Course Code & Title	15M618 CCXI – Complex Analysis		Percentage of Revision : NIL
III B.Sc. Mathematics	Semester : V	Credits : 5	Hrs/ Wk : 6
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • provide an introduction to the theories for functions of a complex variable. • help the students to have an in depth knowledge of limits and continuity, differentiability, analytic functions, conformal mapping, complex integration and residues.		
Employability	**Global Need**	**Participative Learning, Problem solving**	

UNIT	Content	No. of Hours
I	**Analytic Functions** Limit-Continuity and Uniform Continuity- Differentiability and Analyticity – Necessary & sufficient conditions for differentiability – C-R equations in polar coordinates – Complex functions as a function of z.	18
II	**Elementary and Conformal Mappings** Bilinear Transformation – Circles and Inverse points – Transformation for z^2, $z^{1/2}$, $z + \frac{1}{z}$, e^z, log z , sin z , cos z – Conformal mapping – Examples.	18
III	**Complex Integration** Simple rectifiable oriented curves – Integration of complex functions – Simple integrals – Definite integrals – Interior and exterior of a closed curve – Simply connected region – Cauchy's integral formula and formulas for derivatives – Zeroes of a function.	18
IV	**Taylors and Laurent's series** Taylor's series – Zeroes of analytic function – Laurent's series – Cauchy product and division – Singular point – Isolated singularities – Removable singularity – Pole – Essential singularity – Examples.	18
V	**Residues** Definitions – Calculation of Residues – Real definite integrals – Examples.	18
Reference	**Text Books:** P. Duraipandian, Complex Analysis, S. Chand& Company Pvt. Ltd, New Delhi, 2014.	

	Unit I : Ch4 (4.1-4.10)
	Unit II :Ch7 (7.1-7.10)
	Unit III : Ch8 (8.1-8.10)
	Unit IV : Ch9 (9.1-9.9,9.13)
	Unit V : Ch10 (10.1-10.4)
	Reference Books:
	1. S. Arumugam, A. Tangapandi ISAAC, A. Somasundaram, Complex Analysis , Scitech Publications (India) Pvt.Ltd., Chennai,2012.
	2. S. Ponnusamy, Foundations of Complex Analysis, Narosa publishing House, New Delhi,2014.
Course Outcomes	On completion of the course, students should be able to CO 1: acquire knowledge about continuity and differentiability for complex functions. CO 2: understand Taylor's and Laurent's expansion of simple function. CO 3: apply the methods of complex analysis to evaluate definite integrals and infinite series. CO 4: evaluate the nature of singularities and calculating residues.

Course Code & Title	15M619 CCXII – Mechanics	Percentage of Revision : NIL	
III B.Sc. Mathematics	Semester : V	Credits : 4	Hrs/ Wk : 6
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • enable the students to acquire a deep knowledge about the concept of Forces, Moments Friction and resultant of more than one force action on a surface Projectiles, Collision of Elastic Bodies and Motion under a central forces.		
Employability and Skill Development	Global Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	**Forces acting at a points, parallel forces moments** Forces acting at a point parallelogram of forces - Triangle of forces - Lami's theorem – Polygon of forces – Resolution of a force – Theorem on Resolved parts. Parallel Forces and Moments: Resultant of two unlike and unequal parallel forces acting on a rigid body – Conditions of equilibrium of three coplanar parallel forces Moments of a force – Verizon's theorem on moments Generalized Theorem of moments.	18
II	**Equilibrium of three forces Acting on a Rigid Body and Friction** Equilibrium of three force's acting on A Rigid body: Three coplanar forces – Two trigonometric theorems Friction: Types of Friction, Laws of friction, Equilibrium of a body on a rough inclined plane, Equilibrium of a body on a rough inclined plane under a force parallel to the plane Equilibrium of a body on a rough inclined plane under any force.	18
III	**Projectiles** Projectiles– Path of a projectile - Characteristics of the motion of a projectile -Velocity of the projectile - Range of an inclined plane.	18
IV	**Collision of Elastic Bodies** Definitions of Impulsive force and Impulse Collision of Elastic Bodies: Basic definitions fundamental laws of Impact, Impact of a smooth sphere on a fixed smooth plane – Direct and oblique	18

	impact of two smooth spheres – Loss of kinetic energy due to direct and oblique impact of two smooth spheres.	
V	**Motion under a central force** Velocity and acceleration in polar coordinates(no derivation) – Equations of Motion in polar coordinates Motion under a central force Basic Definitions – Differential Equation of central orbit pedal equation of the central orbit – Velocities in a central orbit – Given the orbit to find the law of force to the pole.	18
Reference	**Text Books:** **1.** M.K. Venkataraman, Statics, Agasthiar Publications, 2012. Unit I :Ch 2, Ch3 Unit II :Ch 5, Ch7 **2.** M.K. Venkataraman, Dynamics, Agasthiar Publications, 2012. Unit III :Ch 6(6.1-6.15) Unit IV :Ch 8(8.1-8.8) Unit V :Ch 11(11.5-11.11) **Reference Books:** 1. S.L. Loney, Elements of Statics & Dynamics, A.I.T.B.S. Publications, 1997. 2. P. Duraipadian, Laxmi Duraipandian, Muthamizh Jayapragasam, Mechanics, S. Chand & Company Ltd 2006.	
Course Outcomes	On completion of the course, students should be able to CO 1: acquire the knowledge of forces acting at point and equilibrium of three forces acting on a rigid body. CO 2: understand types of forces, moments and frictions. CO 3: apply the laws of impact to steady collision of bodies CO 4: evaluate the differential equation of central orbit, and pedal – equations.	

Course Code & Title	15M620 CCXIII – Number theory		Percentage of Revision : 40%
III B.Sc. Mathematics	Semester : V	Credits : 5	Hrs/ Wk : 6
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • introduce some basic ideas of Number Theory.		
Employability and Skill Development	**Global Need**	**Participative learning, Problem solving**	

UNIT	Content	No. of Hours
I	The Division algorithm -The Greatest Common Divisor-The Euclidean algorithm –The Diophatine equation $ax + by =c$ -Primes and their distributions: The funtamental theorem of Arithmetic -The sieve of Eratosthenes.	18
II	The Goldbach Conjecture -Carl Friedrich Gauss-Basic properties of congruence- Binary and Decimal Rpresentation of integes - Linear congruences and the Chinese Remainder Theorem.	18
III	Fermat'stheorem-Fermat's Little theorem and Pseudoprimes-Wilson's theorem-The Fermat Kraitchik Factorization method.	18
IV	Number Theoretic functions: The sum and Number of Divisors - The Mobius inversion formula - The greatest integer function - An application to the Calendar: Euler's Generalization of Fermat's theorem: Leonhard Euler-Euler's Phi-function - Euler's theorem - some properties of the Phi –function	18
V	Continued Fractions: Finite continued Fractions-Infinite continued Fractions.	18
Reference	**Text Books:** David M.Burton, Elementary Number Theory, Sixth Edition, TATA McGraw -Hill Publishing Company Limited, New Delhi. Unit I : Ch 2 (2.2 - 2.5), Ch 3 (3.1, 3.2) Unit II :Ch 3(3.3), Ch 4 (4.1-4.4) Unit III :Ch 5(5.1-5.4) Unit IV :Ch 6 (6.1-6.4), Ch 7 (7.1-7.4) Unit V : Ch 15(15.1-15.3)	

	Reference Books: **1. Ivan Niven, Herbert S. Zuckerman, Hugh L. Montgamery,** An Introduction to Theory of Numbers, Fifth Edition Wiley student Edition,2006. **2. M. Apostol,** Introduction to Analytic ,Eighth Edition, Springer International Student Edition, 1998. **3. Bruce C. Berndt** Number Theory in the spirit of Ramanujan, Published by American Mathematical Society (Indian Edition), 2000. **4. George E. Andrews,** Number Theory, Hindustan Publishing Corporation, 1984.
Course Outcomes	On completion of the course, students should be able to CO 1: gain the knowledge to find quotients and remainders from integer division. CO 2: understand the definitions of congruence, residue classes and least residues. CO 3: apply Euclid's algorithm and backwards substitution. CO 4: analyze hypothesis and conclusions of mathematical statements (or) analyze learning methods and techniques used in number theory. CO 5: evaluate multiplicative inverse, modulo n and use to solve linear congruence.

Course Code & Title	**15M621T/L** **CCIX(T/L) – Programming in JAVA with Lab**		**Percentage of** **Revision : 100%**
III B.Sc. **Mathematics**	**Semester : VI**	**Credits : 4**	**Hrs/ Wk : 6**
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • provide an introduction to object oriented programming using the JAVA programming language. Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm. • help the students to develop their programming skills and to build programs in mathematical problems.		
Employability, **Entrepreneurship** **and Skill** **Development**	**Global Need**	**Experiential Learning, Participative** **Learning**	

UNIT	Content	No. of Hours
I	**An overview of JAVA** JAVA language – Fundamentals classes and objects – Constructors- Garbage Collections- Finalize method – Overloading - Recursion data types- Variables and Arrays.	18
II	**Operators and Classes** Arithmetic Operators- Bitwise Operators- Relational Operators- Boolean Logical Operators -Assignment Operators - Control statements - Classes.	18
III	**Inheritance, Packages and Interfaces** Inheritance basics- Method overriding-Abstract classes and object class – Packages- Importing packages- Interfaces.	18
IV	**Exception Handling and Multithreading** Exception handling fundamentals – Java's built in exceptions – Using exceptions the Java thread models – Multithreading – Threading priorities – Inter thread communication.	18
V	**I/O, Applets, AWT** I/O basics – Reading console input – Writing console output – Applet fundamentals – Native methods – AWT classes – Windows fundamentals – Consoles.	18
Reference	**Text Books:** PatrikNaughton& Herbert Shidlt, Java 2: The Complete Reference, TATA McGraw Hill, 7th Edition, 2007. Unit I : Ch 2, Ch 3	

	Unit II :Ch 4, Ch 5, Ch 6
	Unit III : Ch 7, Ch 8, Ch 9
	Unit IV : Ch 10, Ch 11
	Unit V : Ch 12, Ch 21, Ch 22
	Reference Books:
	1. E. Balagurusamy, Programming with Java a Printer Fourth Edition, Tata McGraw Hill Publishing Company Ltd., 2011.
Course Outcomes	On completion of the course, students should be able CO 1: gain knowledge about the structure and model of the Java programming language. CO 2: understand the uses of the JAVA programming language for various programming technologies and mathematical problems. CO 3: apply Java programs to solve simple problems. Develop some software based on mathematics problems in the JAVA programming language. CO 4: evaluate user requirements for software functionality required to decide whether the JAVA programming language can meet user requirements. CO 5: analyze the uses of certain technologies by implementing them in the JAVA programming language to solve the given problem.

Course Code & Title	15M622b EC II – Astronomy	Percentage of Revision : NIL	
III B.Sc. Mathematics	Semester : VI	Credits : 5	Hrs/ Wk : 6
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • introduce the basics of Astronomy. • enable the learners to learn about the moon and Ellipses.		
Employability	Global need	Experiential Learning	

UNIT	Content	No. of Hours
I	Celestial sphere and diurnal motion – Celestial co-ordinates – Siderel time.	18
II	Morning and Evening stars – Circumpolar stars – Zones of Earth – Perpetual day – Twilight.	18
III	Refraction – Laws of Refraction – Tangent formula – Horizontal Refraction – Geocentric parallax.	18
IV	Kepler's laws – Anomalies – Kepler's equations – Calender.	18
V	Moon sidereal and synodic months – Elongation – Phase of moon – Eclipses Umbra and penumbra – Lunar and solar eclipses – Maximum and Minimum number of eclipses in a year.	18
Reference	**Text Books:** Kumaravel.S and Susheela Kumaravel, Astronomy, S.K.V Publication, 8th edition, 1993. Unit I :Pg. No. (39-79) Unit II : Pg. No.(80-90, 106-116) Unit III :Pg. No.(117-144) Unit IV :Pg. No.(146-162, 173-178) Unit V :Pg. No.(229-241, 256-275) **Reference Books:** S. Jeffrey Wright Scott, Introduction to Astronomy, JAS Educational Publications, 2010.	
Course Outcomes	On completion of the course, students should be able to CO 1: gain the knowledge about concepts of sets, mapping, relations and use some basic definition of groups & subgroups. CO 2: understand the importance of algebraic properties with regard to working within various number systems. CO 3: apply the results from group theory to study the properties of rings and fields and to possess the ability to work within their algebraic structure. CO 4: analyze the concepts of homomorphism and isomorphism for groups, rings and field.	

Course Code & Title	15M622a EC II – Mathematical Modeling	Percentage of Revision : NIL	
III B.Sc. Mathematics	Semester : VI	Credits : 5	Hrs/ Wk : 6
Cognitive Level	K – 1 – Acquire K – 2 – Understanding K – 3 – Apply K – 4 – Evaluate K – 5 – Analyze		
Course Objectives	The Course aims to • enable the students to gain knowledge in solving mathematical models Using differential equations, difference equations and graphs.		
Skill Development	Global Need	Participative Learning, Problem Solving	

UNIT	Content	No. of Hours
I	Mathematical modeling through ordinary differential equations - Linear growth and Decay models - Compartment models – Problems in Ordinary Differential Equations of First Order Geometrical Problem.	18
II	Mathematical modeling in Population Dynamics - Modeling of Epidemics – Compartment models – Modelling in Economics – Models in Medicine. Arms,Race,Battles and International Trade Models in Dynamics.	18
III	Mathematical Modelling in Planetary motions – Circular motion and motion of Satellites – Modelling through Linear Differential equations	18
IV	Some simple models on basic theory of Linear Difference equations with constant coefficients – Economics and Finance Population, Dynamics and Genetics in Probability theory.	18
V	Graph models - Models in terms of Directed graph, Signed graph and Weighted Digraphs.	18
Reference	**Text Books:** J.N. Kapur, Mathematical Modeling , Now Age International Pvt Ltd., 2005. Unit I :Ch 2 Unit II :Ch 3 Unit III :Ch 7 Unit IV :Ch 5 Unit V :Ch 7 **Reference Books:** 1. Pundir and Pundir, Bio Mathematics Pragati Prakashan,1ˢᵗ Edition, 2006. 2. Bhupendra Singh, Bio Mathematics Krishna Prakashan Media,2005. 3. J.N. Kapoor Mathematical modeling in Biology and Medicine, East West Press, 1985.	

Course Outcomes	On completion of the course, students should be able to CO 1: gain the knowledge about concepts of sets, mapping, relations and use some basic definition of groups & subgroups. CO 2: understand the importance of algebraic properties with regard to working within various number systems. CO 3: apply the results from group theory to study the properties of rings and fields and to possess the ability to work within their algebraic structure. CO 4: analyze the concepts of homomorphism and isomorphism for groups, rings and field.

Course Code & Title	15M622a EC II – Operations Research	Percentage of Revision : NIL	
III B.Sc. Mathematics	Semester : V	Credits : 5	Hrs/ Wk : 6
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • introduce the fundamentals of operations Research Models including linear programming and applications.		
Employability and Skill Development	Global Need	Problem Solving	

UNIT	Content	No. of Hours
I	**Linear Programming Problem** Introduction to General Linear Programming Problem – Mathematical Formulation – Canonical and Standard forms of L.P.P. – Introduction to Linear Programming Problem – The Computational Procedure – Two Phase Method – BIG-M – Method – Introduction to Duality in Linear Programming – General Primal – Dual Pair – Formulating a Dual Problem – Primal Dual pair in Matrix form-Duality and Simplex Method – Dual Simplex Method.	18
II	**Transportation and Assignment Problem** Introduction to Transportation Problem LP formulation of the Transportation Problem-Existence of solution in T.P. – The Transportation tables – Loops in Transportation table Triangular Basis in a T.P. – Solutions of a T.P. – Finding an Initial Basic Feasible solution – Test for Optimality – Degeneracy in T.P. Assignment Problem – Mathematical Formulation of the problem-Solution methods of Assignment Problem – Special cases in Assignment problems – A typical Assignment problem – The travelling salesman problem.	18
III	**PERT / CPM** Introduction to Network Scheduling by PERT/CPM – Network Basic components – Logical sequencing – Rules of Network construction – Concurrent activities – Critical path analysis – Probability consideration in PERT – Distribution between PERT and CPM.	18
IV	**Sequencing Problem** Introduction to sequencing problem – Basic terms used in sequence-Processing n jobs through two machines – Processing n jobs through k machines-Processing 2 jobs through k machines –	18

	Replacement of Equipment/Asset that Deteriorates Gradually – Replacement of Equipment that fails suddenly.	
V	**Inventory Control** Introduction to Inventory control – Types of Inventories – Costs associated with Inventories Factor affecting Inventory control – The concept of EOQ – Deterministic Inventory problems with no shortages – Deterministic Inventory problem with shortage – Inventory problems with uncertain demand.	18
Reference	**Text Books:** Kantiswarup, P.K. Gupta &Manmohan, Operation Research, Sultan Chand and Sons, 16th Edition, 2012. Unit I : Ch 3(3.4, 3.5), Ch 4(4.1, 4.3, 4.4), Ch 5(5.1-5.4, 5.7, 5.9) Unit II :Ch 10(10.1-10.3, 10.5-10.10), Ch 11(11.1-11.5, 11.7) Unit III :Ch 25(25.1-25.8) Unit IV :Ch12(12.2-12.6), Ch 18(18.2, 18.3) Unit V : Ch 19 (19.1, 19.2, 19.6, 19.7, 19.9-19.11), Ch 20(20.2) **Reference Books:** 1. R. PanneerSelvam, Operations Research, PHI, 2003. 2. H.A. Taha, Operations Research, PHI, 2004. 3. J.K. Sharma, Operations Research for Management, NPH, 1992.	
Course Outcomes	On completion of the course, students should be able to CO 1: gain the knowledge of scientific approaches to decision – making. CO 2: understand the mathematical tools that are needed to solve optimization problems. CO 3: apply the concepts of simplex method and its extensions to dual simplex algorithm. CO 4: analyze the general non linear programming problems. CO 5: evaluate the use of CPM and PERT to plan schedule and control project activities.	

Course Code & Title	**15P103A/15Y103A** **AC I – Allied Mathematics I**		**Percentage of Revision : NIL**
I B.Sc. Physics/Chemistry	**Semester : I**	**Credits : 4**	**Hrs/ Wk : 5**
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • gain the knowledge about the concepts of Binomial, Exponential, Logarithmic Series, Matrices & Trigonometry.		
Employability and Skill Development	**Global Need**		**Participative Learning, Problem solving**

UNIT	Content	No. of Hours
I	**Summation of Series** Binomial, Exponential, Logarithmic Series – Summation of Series – Approximations in Binomial Series(problems only)	15
II	**Matrices** Types of Matrices – Characteristic equation – Eigen Value – Eigen Vector – Cayley Hamilton's theorem (without proof) – Problems.	15
III	**Trigonometry** Expansions for $\cos n\,\theta\,and\,\sin n\theta$ - Expansion of $\cos n\,\theta\,and\,\sin n\theta$ in ascending power of θ - Expansion of $tan\theta$ - Expansion of $\sin^n\theta$, $\cos^n\theta$.	15
IV	**Curvature and Radius of Curvature** Curvature and radius of curvature – Cartesian formula for radius of curvature – Radius of curvature in polor co-ordinates.	15
V	**Successive Differentiation and Partial Differentiation** Successive differentiation – Standard form of nth derivatives – Leibnitz theorem with their Applications. Partial Differentiation: Maxima and Minima of functions of several variables.	15
Reference	**Text Books:** 1. A. Abdul Rasheed, Allied Mathematics, MC.Graw Hill education Pvt. Ltd, 2006. Unit I : Ch 1(1.2.1-1.4.1) Unit II : Ch 3(3.1,3.3,3.4) Unit III : Ch 5(5.1-5.3). Unit IV : Ch 6(6.1-6.3) Unit V : Ch 6(6.4,6.5.1,6.5.2).	

	Reference Books: 1. T.K.ManicavachagamPillay, T.Natarajan, S.Ganapathy, Algebra, S.V.Publication, 1999. 2. T. K. ManicavachagomPillay,Trigonometry, S.V. Publication, 1999. 3. P.R. Vittal, Allied mathematics, Margham publishers,3rd edition 2002.
Course Outcomes	On completion of the course, students should be able to CO 1: recollect basic concepts of Binomial, Exponential series, matrices. CO 2: understanding the concepts of the characteristic equation and its applications in matrices. CO 3: apply the integral concepts to extend the study of multiple integrals. CO 4: express the given series in Fourier form

Course Code & Title	15P104A/15Y104A AC II – Allied Mathematics II		Percentage of Revision : 40%
I B.Sc. Physics/Chemistry	Semester : I	Credits : 4	Hrs/ Wk : 4
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • gain knowledge about the concepts of Differentiation, Integration		
Employability and Skill Development	Global Need		Participative Learning, Problem solving

UNIT	Content	No. of Hours
I	**Finite Differences** Finite differences – Newton's forward & Backward difference formula for Interpolation and Lagrange's interpolation.(Problem only)	12
II	**Reduction Formula** Reduction Formula for $\sin^n x$, $\cos^n x$ and $\sin^m x \cos^m x$- Properties of definite integrals.	12
III	**Multiple Integrals** Double Integrals – Triple Integrals – Change of Order of Integration – Simple Problems only.	12
IV	**Fourier Series** Definition of Fourier series – Fourier coefficients – Odd and Even functions in evaluating Fourier coefficients – Half range Fourier Sine and Cosine series – Simple problem only.	12
V	**Statistical Distribution** Discrete & Continuous distribution: Binomial, Poisson & Normal distributions, Mean, Variance, Recurrence Relation, Additive Property, Moment Generating function of these distributions, Properties of Normal distribution.	12

Reference	**Text Books:**
	  1. A. Abdul Rasheed, Allied Mathematics, MC.Graw Hill education Pvt. Ltd, 2006.
	Unit I : Ch 4
	Unit II : Ch 7(7.5-7.6)
	Unit III : Ch 8(8.1-8.3)
	Unit IV : Ch 9
	  2. S. C. Gupta, Fundamental of Statistics, Himalaya Publishing House, 6th edition, 2004.
	Unit V : Ch 14
	Reference Books:
	  1. P. R. Vittal, Allied Mathematics, Margham Publications, 3rd edition.
	  2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th edition, 2002.
	  3. S. S. Sastry, Introductory of Numerical Analysis, PHI, 1995.

Course Outcomes	On completion of the course, students should be able to CO 1: recollect basic concepts of Fourier series. CO 2: understanding about the concept of multiple integrals and statistical methods. CO 3: get an idea about trigonometric functions $\sin^n x$, $\cos^n x$, expansion of sinnx, cosnx in powers of $\sin x$ and $\cos x$, Hyperbolic functions and Inverse Hyperbolic functions. CO 4: solving the polynomial equations using interpolating methods: Newton's forward, backward and Lagrange's methods.

Course Code & Title	15P206A/15Y206A AC III – Allied Mathematics III		Percentage of Revision : NIL
I B.Sc. Physics/Chemistry	Semester : II	Credits : 4	Hrs/ Wk : 5
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • gain the knowledge about the concepts of ordinary differential equations, partial differential equations, Laplace transforms, Vector differentiation and Vector Integration.		
Employability and Skill Development	Global Need		Participative Learning, Problem solving

UNIT	Content	No. of Hours
I	Ordinary Differential Equations Ordinary Differential Equations of first order but of higher degree – Equations solvable for x,y,p – Clairaut's Equations – Second order differential equations with constant coefficients – Finding Particular integrals when the RHS is of the type of e^{kx}, sinkx, coskx, X^k, $e^{kx}f(x)$.	15
II	Partial Differential Equations Formation of Partial Differential Equations of first order by eliminating arbitrary constants & arbitrary functions – Definition of kinds of solutions – Four standard forms and Lagrange's methods – PDE reducible to standard forms.	15
III	Laplace Transforms Definition of Laplace Transform – Standard functions of Laplace Transform – First Shifting theorem – Inverse transforms relating to the above standard forms – Solving differential equation using Laplace Transforms.	15
IV	Vector Differentiation Vector and scalar fields – Gradient, Divergence, Curl of vector – Laplacian Operator – Vector Identities – Directional derivative.	15
V	Vector Integration Line integrals – Surface integrals – Volume integrals – Gauss divergence – Stoke's theorem and Green's theorem and their applications.	15

Reference	**Text Books:**
	1. A. Abdul Rasheed, Allied Mathematics, MC.Graw Hill education Pvt. Ltd, 2006.
	Unit I : Ch 10(10.1 - 10.4)
	Unit II : Ch 11
	Unit III : Ch 12
	Unit IV : Ch 13
	Unit V : Ch 14
	Reference Books:
	1. P. R. Vittal, Allied Mathematics, Margham Publications, 3rd edition.
	2. M. K. Venkatraman, Engineering Mathematics, NPC, 1998.
	3. P. Kandasamy, K. Thilagavathy, K. Gunavathy, Engineering Mathematics, S. Chand, 1987.
Course Outcomes	On completion of the course, students should be able to
	CO 1: remember the basic concepts of Differential Equations, Integration and Vector.
	CO 2: understanding about the concept of Formation of differential equations and solving the partial differential equations.
	CO 3: get an idea about the Laplace transforms and apply the differential equations.
	CO 4: get an idea about the Laplace transforms and apply the differential equations.

Course Code & Title	15S103A AC I – Basic Mathematics		Percentage of Revision : NIL
I B.Sc. Computer Science	Semester : I	Credits : 4	Hrs/ Wk : 5
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • introduce the concepts of matrices, successive differentiation, Laplace transforms and Fourier series.		
Employability and Skill Development	**National Need**	**Participative Learning, Problem solving**	

UNIT	Content	No. of Hours
I	Types of Matrices – Characteristic Equation – Eigen Values – Eigen Vectors – Cayley Hamilton's Theorem (without proof)	15
II	Successive differentiation-Leibnitz's theorem and its applications-Integration by parts – Definite integrals and its properties.	15
III	To solve the second order differential equations when the RHS is of the type e^{kx}, $\sin kx$, $\cos kx$, $x^k e^{ax} x$.	15
IV	Definition of Laplace transform - Laplace transforms of e^{at}, cos at, coshat, t^n, first shifting theorem – Laplace transforms of $f'(t), f''(t)$ Inverse Transforms relating to the above standard forms –Applications to the solutions of ODE with constant coefficients involving the above transformations.	15
V	Definition of Fourier series- Finding Fourier constants for periodic function with period 2π - odd and even functions- Half-Range series.	15

Reference	**Text Books:**
	    1. P.Kandasamy, K. Thilagavathy, Allied Mathematics, Paper I, S. Chand & Company Ltd., 2003.
	    Unit I:(P.No: 72 – 76, 114 – 128) Unit II: (P.No: 229 – 245)
	    2. P.Kandasamy, K. Thilagavathy, Allied Mathematics, Paper II, S. Chand & Company Ltd., 2003.
	    Unit II:(P.No: 46 – 50) Unit IV: (P.No: 234 – 284)
	    Unit V: (P.No: 140 – 159)
	    3. S. Narayanan, T. K. ManicavachagomPillai, Calculus, Volume III, S. V. Publications, 2010.
	    Unit III: Ch 8
	Reference Books:
	4. M.K. Venkataraman, Engineering mathematics,NPC,1998
	5. P.R. Vittal, Allied mathematics, Margham publishers,1997.	

Course Outcomes	On completion of the course, students should be able to
	CO 1: recollect the basic concepts of matrices and differentiation.
	CO 2: understand the concepts about fundamental of ODE and characteristic equation of a linear transformation and Cayley Hamilton theorem.
	CO 3: solving the differential equations when the RHS is of the type e^{kx},sinkx,coskx, x^k,e^{ax}x.
	CO 4: demonstrate the Laplace transform and the apply the differential equation and Fourier series, finding Fourier constants for periodic function with period 2π and half range Fourier series with period π.

Course Code & Title	15S104A AC II – Operations Research	Percentage of Revision : NIL	
I B.Sc. Computer Science	Semester : I	Credits : 4	Hrs/ Wk : 4
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • understand the basic marketing concepts and its applications in markets. • enhance the student knowledge in linear programming problem, Transportation problem, Assignment problem, Sequencing and Network scheduling.		
Employability and Skill Development	Global Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	Linear Programming Problem (LPP): Introduction – Canonical and Standard forms of LPP -Mathematical formulation of LPP – Solution for LPP: Graphical Method - Simplex Method Charne's Penalty (Big-M) Method – Two Phase Simplex Method	12
II	Transportation problem (TP) – Algorithm degeneracy – Algorithm degeneracy in TP - Unbalanced TP.	12
III	Assignment Algorithm – Unbalanced Assignment problem.	12
IV	Sequencing problem - Processing of n jobs through two machines – Processing of n job through three machines – Processing of two jobs through m machines.	12
V	Network – Fulkerson's rule – Measure of activity – PERT computations – CPM computation.	12
Reference	**Text Books:** Kanti Swarup, P.K. Gupta, Man Mohan, Operations Research, Sultan Chand &Company Ltd,11th Edition , 2003. Unit I : Ch 2,3 Unit II : Ch 6 Unit III : Ch 7 (7.1-7.3) Unit IV : Ch 10 (10.1-10.5) Unit V : Ch 21 **Reference Books:** **1.** A. Taha, Operations Research, Keerthi Publishing House, 1997. **2.** J. K. Sharma, Operations Research for Management, NPH, 1992. **3.** Prem Kumar Gupta, D.S. Hira,Problems in Operations Research, S. Chand, 2010.	
Course Outcomes	On completion of the course, students should be able to CO 1: understand linear programs from standard business problems. CO 2: construct a project network and apply program evaluation review technique and critical path management. CO 3: apply the fundamental concept of sequencing problem. CO 4: solve the problems using PERT and CPM methods.	

Course Code & Title	15S207A AC III – Numerical & Statistical Methods	Percentage of Revision : NIL	
I B.Sc. Computer Science	Semester : II	Credits : 4	Hrs/ Wk : 5
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • enable the students to gain knowledge in solving system of equations. • provides the techniques to find numerical solutions for various integrals.		
Employability and Skill Development	National Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	Introduction - The Solution of numerical algebraic & Transcendental equations – Bisection method – Newton Raphson method – Iteration Method – Simultaneous Linear Algebraic equations – Gauss Elimination method – Jacobi and Gauss-Seidel methods .	15
II	Finite differences – Forward, Backward differences – Interpolation formulae – Newton-Gregory forward interpolation - Newton backward interpolation - Lagrange's interpolation-Numerical Differentiation.	15
III	Numerical Integration – Trapezoidal rule – Simpson's $1/3^{rd}$ rule – Numerical Solution of ODE – Taylor series methods - Solution by Euler's method – Runge Kutta 2nd and 4th order methods.	15
IV	Mean, Median, Mode, Standard Deviation – Correlation & Regression – Properties – Standard error of estimate.	15
V	Discrete & continuous distributions: Binomial, Poisson, Normal distributions – Mean, Variance, Recurrence relation, Additive property, Moment generating function of these distributions – Properties of normal distribution.	15
Reference	**Text Books:** 1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company Ltd, Revised Edition, 2005. Unit I : Ch3(3.1,3.2, 3.4), Ch 4(4.2,4.8,4.9) Unit II : Ch 5(5.1-5.3), Ch 6(6.1-6.3),Ch 7(7.5), Ch 8(8.7) Unit III : Ch 9(9.2-9.4,9.9,9.13),Ch 11(11.5,11.9,11.12,11.13). 2. S. C. Gupta, Fundamentals of Statistics, Himalaya Publishing House,2009. Unit IV : Ch 5(5.4 - 5.7) Ch 6(6.9) Unit V : Ch 8(8.1-8.4), Ch 11(11.5,11.9,11.12,11.13)	

	Reference Books: 1. S.C. Gupta and V.K. Kapoor, Fundamentals of Statistics ,Himalayan Publishing House, 2000, ISBN: 81-7014-791-3 2. S.S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall Publications ,2012 , ISBN: 8120345924
Course Outcomes	On completion of the course, students should be able to CO 1: understands different methods to solve the non-linear equations CO 2: acquire the knowledge of regression analysis CO 3: apply various methods to solve various integrals CO 4: computing probabilities based on practical situations using binomial, poisson and normal distributions.

Course Code & Title	15A103A AC I – Statistical Method	Percentage of Revision : NIL	
I BCA	Semester : I	Credits : 4	Hrs/ Wk : 5
Cognitive Level	**K – 1** – Acquire **K – 2** – Understanding **K – 3** – Apply **K – 4** – Evaluate **K – 5** – Analyze		
Course Objectives	**The Course aims to** • improve the basic knowledge relevant to their major subjects. This syllabus enables students to learn about the concept of analysis and probability distribution.		
Employability and Skill Development	Global Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	Measures of central tendencies and dispersion: Mean, Median, Mode, Standard Deviation, Variance, coefficient of variation.	15
II	Skewness, Moments and Kurtosis.	15
III	Correlation and Regression Analysis: Types of correlation-Karl Pearson's coefficient of correlation, Rank Correlation coefficient- Regression lines-equations.	15
IV	Definition of probability - Axiomatic approach to probability - Addition and Multiplication Theorems - Conditional Probability - Independent Events – Baye'stheorem.	15
V	Random Variables- distribution and density functions-Binomial, Poisson and Normal distributions: Definitions, Moments and Simple problems.	15
Reference	**Text Books:** S.C. Gupta, Fundamentals of Statistics, Himalaya Publishing House, 2009. Unit I : Ch 5 (5.4 - 5.6, 5.7 - 5.7.1, 5.7.2), Ch 6 (6.9, 6.9.1-6.9.4) Unit II : Ch 7 Unit III : Ch 8 (8.1 - 8.1.1, 8.4, 8.7), Ch 9 (9.1, 9.2,9.3-9.3.1-9.3.3) Unit IV : Ch 12 (12.7-12.11) Unit V : Ch 13 (13.1 - 13.5), Ch 14 (14.1-14.4) **Reference Books:** **1.** S.C.Gupta and V.K.Kapoor, Fundamentals of Statistics, Himalayan publishingHouse, 1992. **2.** S.P.Gupta and V.K.Kapoor, Statistical Methods, S Chand & Co., 2009.	
Course Outcomes	On completion of the course, students should be able to CO 1: acquire the concepts of Mean, Median and Standard deviation CO 2: understand the knowledge of Skewness and Kurtosis, Correlation and Regression Analysis. CO 3: apply the knowledge of axiomatic approach to independent events CO 4: evaluate the Binomial, Poisson and Normal Distribution	

Course Code & Title	**15A104A** **AC II – Operations Research for Computer Applications**	**Percentage of Revision : NIL**	
I BCA	**Semester : I**	**Credits : 4**	**Hrs/ Wk : 4**
Cognitive Level	**K – 1** – Acquire **K – 2** – Understanding **K – 3** – Apply **K – 4** – Evaluate **K – 5** – Analyze		
Course Objectives	**The Course aims to** • provide the basic tools of operations research in solving the management problems using mathematical approach for decision making. • understand the concepts of linear programming problem. Transportation problems, Assignment problems, Sequencing and network scheduling.		
Employability and Skill Development	**Global Need**	**Participative Learning, Problem solving**	

UNIT	Content	No. of Hours
I	Linear Programming formulations – Graphical Solutions of two variables – Canonical and Standard forms of LPP.	12
II	Simplex method for <,=,> constraints – Simplex method – Big M method.	12
III	Transportation problem Algorithm – degeneracy algorithm – Degeneracy in TP – Unbalanced TP – Assignment Algorithm – Unbalanced Assignment problem.	12
IV	Sequencing problem - Processing of n jobs through two machines – Processing of n job through three machines – Processing of two jobs through m machines.	12
V	Network – Fulkerson's rule – Measure of activity – PERT computations – CPM computation.	12
Reference	**Text Books:** KantiSwarup, P.K. Gupta, ManMohan, Operations Research, Sultan Chand &Company Ltd,11th Edition , 2003. Unit I : Ch 1, Ch2 Unit II : Ch 3 Unit III : Ch 6, Ch 7 (7.1-7.3) Unit IV : Ch 10 (10.1-10.5) Unit V : Ch 21 **Reference Books:** 1.A. Taha, Operations Research, Keerthi Publishing House, 1997. 2.J. K. Sharma, Operations Research for Management, NPH, 1992. 3.Prem Kumar Gupta, D.S. Hira, Problems in Operations Research, S. Chand, 2010.	
Course Outcomes	On completion of the course, students should be able to CO 1: convert standard business problems into linear programs. CO 2: solve linear programming problems by Graphical solution, Simplex and Big-M method. CO 3: apply the fundamental concept of sequencing problem. CO 4: evaluate the PERT and CPM.	

Course Code & Title	15A207A AC III – Algebra and Calculus		Percentage of Revision : 10%
I BCA	**Semester : I**	**Credits : 4**	**Hrs/ Wk : 5**
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The Course aims to** • gain the knowledge about differentiation, integration, differential equation, Laplace transformation and matrices.		
Employability and Skill Development	**National Need**	**Participative Learning, Problem solving**	

UNIT	Content	No. of Hours
I	Types of matrices – Characteristic Equation – Eigen values – Eigen vectors – Cayley Hamilton's theorem (without proof).	15
II	Successive differential – Leibnitz's theorem and its application.	15
III	Evaluation of integrals if types $1.\int \frac{dx}{ax+bx+c}$ $2.\int \frac{dx}{\sqrt{ax^2+bx+c}}$ $3.\int \frac{(px+q)dx}{ax^2+bx+c}$ $4.\int \frac{(px+q)dx}{\sqrt{ax^2+bx}}$ - Integrating by parts – Definite integral and its properties.	15
IV	To solve the second order differential equations when the RHS is of the type e^{kx}, $\sin kx, \cos kx, x^k, e^{a\square}X$.	15
V	Definition of Laplace transform – Laplace transforms of e^{at}, $\cos at, \cos hat$, t^n, first shifting theorem – $e^{-at} f(t)$, $\dot{f}(t), f''(t)$ – Inverse transforms relating to the above standard forms.	15
Reference	**Text Books:** A.AbdulRasheed,Allied Mathematics, MC.Graw Hill education Pvt. Ltd,2006. Unit I : Ch(3.1,3.3, 3.4) Unit II : Ch 6(6.4) Unit III : Ch 7(7.3-7.3.1,7.3.2,7.4,7.6). Unit IV : Ch 10(10.4) Unit V : Ch 12(12.1,12.2). **Reference Books:** 1. M.K.Venkatraman, Engineering Mathematics,NPC-1998 **2.** P.Kandasamy, K.Thilagavathy, K.Gunavathy, Engineering Mathematics, S.Chand& Company Ltd,1987.	
Course Outcomes	On completion of the course, students should be able to CO 1: understand the concepts of types of matrices, successive differentiation, integration and Laplace transform. CO 2: find the eigen values and vectors, Leibnitz's theorem and its application. CO 3: apply the concepts of Laplace transforms of e^{at}, $\cos at, \cos hat$, t^n and integration by parts and its properties. CO 4: solve the second order differential equation of the type e^{kx}, $\sin kx, \cos kx, x^k, e^{ax}X$.	

Course Code & Title	15B411A AC I – Operation Research	Percentage of Revision: NIL	
Class	II BBA	Semester	IV
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	The Course aims to		
Employability and Skill Development	Global Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	**Introduction to OR and LPP** Meaning and scope – Characteristics – LPP formulation – Graphical method – Simplex method – Application in business – Merits and demerits.	15
II	**Transportation problems** Introduction – Basic feasible solution – Formulation – Solving transportation problems – North West corner rule – Vogel's approximation –least cost method – Assignment problems.	15
III	**Network analysis** Introduction – Numbering of event – time estimates in network analysis – Critical path method – PERT method.	15
IV	**Queuing theory & Game theory** Definition – benefits of Queuing theory – Single channel Queuing model – Queuing cost behaviour – Game theory:Meaning and characterization – Saddle point – Dominance property- Different methods – of solving game theory problems (No LPP)	15
V	**Decision theory** Definition – Structure of decision making problem - Types of decision making criteria – Baye's theorem and its application – Decision tree analysis.	15
Reference	**Text Books:** **1. V. K. Kapoor**, Operation Research, Sultan Chand & Sons, 1991. **Reference Books:** **1. P. K. Gupta & Manmohan,** Problems in Operation Research, Sultan Chand & Sons, 1994. **2. R. Panneerselvam,** Operation Research, PHI Learning India Private Limited, 2009. **3. P. R. Vittal and V. Malini,** Operation Research, Margham Publications, 2012.	
Course Outcomes	On completion of the course, students should be able to CO 1: understand linear programs from standard business problems. CO 2: construct a project network and apply program evaluation review technique and critical path management. CO 3: apply the fundamental concept of sequencing problem. CO 4: solve the problems using PERT and CPM methods.	