NEHRU MEMORIAL COLLEGE

(AUTONOMOUS)
(Nationally Accredited with 'A' Grade)
PUTHANAMPATTI - 621007.

PROGRAMME

B.SC. MATHEMATICS

SYLLABUS

(For the students admitted from 2019 – 2020 onwards)

PG & RESEARCH DEPARTMENT OF MATHEMATICS

01/10/2018

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)
Under Graduate Programme Course Structure CBCS
(For the candidates admitted from 2019 – 2020 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	15	74	61	I – VI SEMESTER
III	ELECTIVE I, II, III	3	15	15	V, VI SEMESTER
III	ALLIED – I YR ALLIED – II YR	3 3	14 17	12 12	I, II SEMESTER III,IV SEMESTER
IV	SKBC I, SKBC II	2	4	4	II, III SEMESTER
IV	NMEC I, NMEC II	2	4	4	IV, V SEMESTER
IV	SOFT SKILLS	1	-	2	IV SEMESTER
IV	GENDER STUDIES	1	-	1	III SEMESTER
IV	VALUE EDUCATION	1	2	2	I SEMESTER
IV	ENVIRONMENTAL STUDIES	1	2	2	II SEMESTER
V	EXTN. ACTIVITIES	1	-	1	VI SEMESTER
TOTAL		**41**	**180**	**140**	-
Extra Credit Course(Offered by College)					
	COMPREHENSIVE	1	-	4	-
	SKBC III	1	-	2	-
TOTAL				**146**	

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)
UG Programme (Mathematics) – Curriculum Framework
For the candidates admitted from 2019 – 2020 onwards

Sem.	Code	Title	Hrs/Wk	Credits	Marks Int.	Marks Ext.	Marks Ext.
I	LC	Language Course (Tamil) I	6	3	25	75	100
	ELC	English Language Course I	6	3	25	75	100
	CC	Core Course I	5	4	25	75	100
	CC	Core Course II	4	4	25	75	100
	AC	Allied Course I	4	4	25	75	100
	AC	Allied Course II*	3	-	-	-	-
	VE	Value Education	2	2	25	75	100
	Total	**7**	**30**	**20**	**150**	**450**	**600**
II	LC	Language Course(Tamil) II	6	3	25	75	100
	ELC	English Language Course II	6	3	25	75	100
	CC	Core Course III	4	4	25	75	100
	CC	Core Course IV	3	2	25	75	100
	AC	Allied Course II*	3	4	40	60	100
	AC	Allied Course III	4	4	25	75	100
	EVS	Environmental Studies	2	2	25	75	100
	SKBC	Skill Based Course I	2	2	25	75	100
	Total	**8**	**30**	**24**	**215**	**585**	**800**
III	LC	Language Course(Tamil) III	6	3	25	75	100
	ELC	English Language Course III	6	3	25	75	100
	CC	Core Course V	5	4	25	75	100
	AC	Allied Course IV	6	4	25	75	100
	AC	Allied Course V	5	4	25	75	100
	SKBC	Skill Based Course II	2	2	25	75	100
	GS	Gender Studies	-	1	-	100	100
	Total	**7**	**30**	**21**	**150**	**550**	**700**

Sem.	Code	Title	Hrs/Wk	Credits	Marks		
					Int.	Ext.	Tot.
IV	LC	Language Course (Tamil) IV	6	3	25	75	100
	ELC	English Language Course IV	6	3	25	75	100
	CC	Core Course VI	5	4	25	75	100
	CC	Core Course VII	5	4	25	75	100
	AC	Allied Course VI	6	4	25	75	100
	NMEC	Non Major Elective Course I	2	2	25	75	100
	SSC	Soft Skill Course	-	2	-	100	100
	Total	**7**	**30**	**22**	**150**	**550**	**700**
V	CC	Core Course VIII	6	5	25	75	100
	CC	Core Course IX	6	5	25	75	100
	CC	Core Course X	6	5	25	75	100
	CC	Core Course XI	5	4	25	75	100
	EC	Elective Course I	5	5	25	75	100
	NMEC	Non Major Elective Course II	2	2	25	75	100
	Total	**6**	**30**	**26**	**150**	**450**	**600**
VI	CC	Core Course XII	6	5	25	75	100
	CC	Core Course XIII	6	5	25	75	100
	CC	Core Course XIV	5	4	25	75	100
	CC	Core Course XV	3	2	25	75	100
	EC	Elective Course II	5	5	25	75	100
	EC	Elective Course III	5	5	25	75	100
	EA	Extension Activities	-	1	-	-	-
	Total	**7**	**30**	**27**	**150**	**450**	**600**
TOTAL			**42**	**180**	**140**	**965**	**3035**	**4000**
Extra Cr. Courses offered by College		**2**	**-**	**6**	**-**	**200**	**200**

*Exam at the end of the academic year

NEHRU MEMORIAL COLLEGE (AUTONOMOUS)

UG Programme (Mathematics) – Course Structure CBCS

For the candidates admitted from 2019 – 2020 onwards

Sem	Part	Code	Title of Course	Hrs/Wk	Cr	Marks		
						Int.	Ext.	Tot.
I	I	19T101	LC I – Tamil I	6	3	25	75	100
	II	19H101	ELC II – English I	6	3	25	75	100
	III	19M101	CC I – Calculus	5	4	25	75	100
	III	19M102	CC II – Trigonometry and Algebra	4	4	25	75	100
	III	19M103A	AC I – Allied Physics I	4	4	25	75	100
	III	19M104L	AC II – Physics Lab*	3	-	-	-	-
	IV	19VE	VE – Value Education	2	2	25	75	100
		Total	**7**	**30**	**20**	**150**	**450**	**600**
II	I	19T202	LC II – Tamil II	6	3	25	75	100
	II	19H202	ELC II – English II	6	3	25	75	100
	III	19M205	CC III – Differential Equations and its Applications	4	4	25	75	100
	III	19M206	CC IV – Laplace Transforms and Summation of Series	3	2	25	75	100
	III	19M104L	AC II – Physics Lab*	3	4	40	60	100
	III	19M207A	AC III – Allied Physics II	4	4	25	75	100
	IV	19XM21L	SKBC I – MS Office	2	2	25	75	100
	IV	19EVS	EVS – Environmental Studies	2	2	25	75	100
		Total	**8**	**30**	**24**	**215**	**585**	**800**
III	I	19T303	LC III – Tamil III	6	3	25	75	100
	II	19H303	ELC III – English III	6	3	25	75	100
	III	19M308	CC V – Analytical Solid Geometry	5	4	25	75	100
	III	19M309A	AC IV – Probability Theory	6	4	25	75	100
	III	19M310A	AC V – Statistical Methods	5	4	25	75	100
	IV	19XM32L	SKBC II – SCILAB	2	2	25	75	100
	IV	19GS	GS – Gender Studies	-	1	-	100	100
		Total	**7**	**30**	**21**	**150**	**550**	**700**

Sem	Part	Code	Title of Course	Hrs/Wk	Cr	Int.	Ext.	Tot.
IV	I	19T404	LC IV – Tamil IV	6	3	25	75	100
	II	19H404	ELC IV – English IV	6	3	25	75	100
	III	19M411	CC VI – Vector Calculus , Fourier Series & Fourier Transforms	5	4	25	75	100
	III	19M412	CC VII– Numerical Methods	5	4	25	75	100
	III	19M413AL	AC VI – R- Programming Lab	6	4	25	75	100
	IV	19M4N1	NMEC I – Quantitative Aptitude I	2	2	25	75	100
	IV	19SSC	SSC – Soft Skill Course	-	2	-	100	100
		Total		**7**	**30**	**22**	**150**	**550**	**700**
V	III	19M514	CC VIII – Modern Algebra	6	5	25	75	100
	III	19M515	CC IX – Real Analysis I	6	5	25	75	100
	III	19M516	CC X – Mechanics	6	5	25	75	100
	III	19M517	CC XI – Graph Theory	5	4	25	75	100
	III	19M518**	EC I	5	5	25	75	100
	IV	19M5N2	NMEC II – Quantitative Aptitude II	2	2	25	75	100
		Total		**6**	**30**	**26**	**150**	**450**	**600**
VI	III	19M619	CC XII – Real Analysis II	6	5	25	75	100
	III	19M620	CC XIII – Complex Analysis	6	5	25	75	100
	III	19M621	CC XIV- Discrete Mathematics	5	4	25	75	100
	III	19M622	CC XV – Mathematical Modeling	3	2	25	75	100
	III	19M623**	EC II	5	5	25	75	100
	III	19M624**	EC III	5	5	25	75	100
	V	19EA	Extension Activities	-	1	-	-	-
		Total		**7**	**30**	**27**	**150**	**450**	**600**
	TOTAL			**42**	**180**	**140**	**965**	**3035**	**4000**
			Extra Cr. Courses (College)	**+2**		**+6**		**+200**	**+200**

*Exam at the end of the academic year

**EC - Elective Courses:

Sem.	Elective Code	Code	Course
V	EC I	19M518b(T/L) 19M518a	Programming in C with Lab Fuzzy Theory
VI	EC II	19M623b 19M623a	Operations Research Astronomy
	EC III	19M624b(T/L) 19M624a	Object Oriented Programming in C++ with Lab Number Theory

Bloom's Taxonomy Based Assessment Pattern

K1 – Acquire; **K2** – Understanding; **K3** – Apply; **K4** – Evaluate; **K5**– Analyze

Part I, II, III& IV

(a) **Theory** (External + Internal = 75 + 25 = 100 marks)

External					
Knowledge Level	**Section**	**Marks**	**Hrs**	**Total**	**Passing Mark**
K1,K2	A(Answer all)	$10 \times 2 = 20$			
K2,K3,K4	B(Either or pattern)	$5 \times 5 = 25$	3	75	30
K2,K3,K4,K5	C(Answer 3 out of 5)	$3 \times 10 = 30$			
Internal					
Components		**Convert Marks**	**Hrs**	**Total**	**Passing Mark**
CIA 1	75	10	3		
CIA 2	75	10	3	25	10
Assignment/Seminar	20	5	-		
			Total	**100**	**40**

(b) **Lab** (External + Internal = 60 + 40 = 100 marks)

External					
Knowledge Level	**Section**	**Marks**	**Hrs**	**Total**	**Passing Mark**
K3	A	20			
K4	B	30	3	60	30
K5	Record	10			
Internal					
Knowledge Level	**Section**	**Marks**	**Hrs**	**Total**	**Passing Mark**
K3, K4, K5	Practical	40	3	40	10
			Total	**100**	**40**

(c) **Theory/Lab** (External + Internal = 75 + 25 = 100 marks)

External (Theory)					
Knowledge Level	**Section**	**Marks**	**Hrs**	**Total**	**Passing Mark**
K1,K2	A(Answer all)	$10 \times 2 = 20$			
K2,K3,K4	B(Either or pattern)	$5 \times 5 = 25$	3	75	35
K2,K3,K4,K5	C(Answer 3 out of 5)	$3 \times 10 = 30$			
External (Lab)					
K3	A	35			
K4	B	25	3	75	25
K5	Record	15			
Internal (Theory)					
Components		**Convert Marks**	**Hrs**	**Total**	**Passing Mark**
CIA 1	75	10	3		
CIA 2	75	10	3	25	12
Assignment/Seminar	20	5	-		
Internal (Lab)					
Knowledge Level	**Section**	**Marks**	**Hrs**	**Total**	**Passing Mark**
K3, K4, K5	Practical	25	3	25	8
			Total	**200/2 =100**	**80/2 =40**

NEHRU MEMORIAL COLLEGE
(AUTONOMOUS)
Puthanampatti, Trichy Dist.

SYLLABUS REVISION 2019-2020

Department : **MATHEMATICS**

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

Year of Implementation : **2019-2020**

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 toassess 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 demandin 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 anunderstanding 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, includingsurvey 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	19M101 CCI – Calculus		
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 and 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** The nth derivative of standard functions–The 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 functions of two variables.	13
II	**Curvature and Evolutes** Curvature – Length of arc as a function – Radius of curvature – Evolutes and involutes.	13
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.	13
IV	**Multiple Integrals** Multiple Integrals – Double Integrals – Change of order of Integration – Triple Integrals.	13
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.	13
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) **Unit II :** Ch 14 : § (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, Volume 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, VolumeI, 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 minimaof 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.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	1	1	3	3	2	2	1	2	3	1
CO2	3	2	2	1	2	3	2	1	1	3	3	2
CO3	2	3	2	3	2	1	1	3	3	2	1	3
CO4	2	3	2	1	1	3	3	3	2	3	3	3

Strongly Correlating(S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

Course Code & Title	19M102 CC II – Trigonometry and Algebra		
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** • 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 $\sin n\theta$ and $\cos n\theta$-Expansion for $\tan n\theta$, Expansion for $\cos^n\theta$ and $\sin^n\theta$ in terms of multiple angles of θ -Expansion of $\sin\theta$ and $\cos\theta$ in ascending powers of θ.	10
II	**Hyperbolic and Logarithmic functions** Hyperbolic functions-Inverse Hyperbolic functions – Logarithms of complex numbers-Real and Imaginary parts of $\log(x+iy)$ –Logarithm of a negative real number.	10
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.	11
IV	**Matrices** Consistency – Eigen values and Eigen vectors – Similar matrices – Cayley Hamilton theorem(statement only) - Symmetric, Skew Symmetric, Orthogonal, Hermit Ian, Skew Hermit Ian and Unitary matrices(simple problems).	11
V	**Inequalities** Elementary principles – Geometric and Arithmetic means – Wierstrass' Inequality – Cauchy's Inequality.	10
Reference	**Text Books:** **1. P.R.Vittal**, Trigonometry, Markham Publication, 1998. **Unit I :** Ch 5	

	Unit II : Ch 7 &Ch 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 : § (11 - 19) **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, 9.1-9.2,16,17) **Unit V :** Ch 4 : § (1-5,9-11) **Reference Books:** 1.**Hall and Knight**, Higher Algebra, Fourth Edition, ArihantPrakashan, 2012. **2.P.KandasamyandK.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.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	1	2	3	2	2	1	3	3	2
CO2	3	3	2	2	1	3	2	1	2	3	2	2
CO3	2	3	2	3	2	1	2	3	3	2	1	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M205 CC III-Differential Equation and its Applications		
I B.Sc. Mathematics	Semester : II	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 the ability to solve the problems related to first and higher order linear differential equations and partial differential equations. • 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	**Equations of the First Order and of the First Degree** Exact Differential Equations – Equations of the first order, but of higher degree: Equations solvable for p, x, y and Clairaut's Equation.	10
II	**Linear Equations with Constants and variable Coefficients** Definitions – The Operator D – Complementary function ofaLinear Equations with Constant Coefficients – Particular Integral - Linear Equations with Variable Coefficients.	11
III	**Partial Differential Equations of the First Order** Classification of Integrals – Derivation of Partial differential equations – Lagrange's method of solving the linear equation - special methods; standard forms.	11
IV	**Partial Differential Equations of Higher Order** Partial differential equations of higher order – Homogeneous differential equations.	10
V	**Applications of Differential Equations** Orthogonal Trajectories – Growth and Decay – Continuous Compound Interest – Simple Harmonic Motion – Simple pendulum.	10
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 : § (1-5)
	UnitIII: Ch 12 : § (1-5(5.1-5.4), 6)
	2.S.Arumugam and A. Thangapandi Isaac, Differential Equations and its Applications, New Gamma Publication, 2011.
	Unit IV: Ch5
	Unit V: Ch 6: § (6.1-6.3, 6.8, 6.9)
	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,EngineeringMathematics,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 and PDE.
	CO 2: solve the problems choosing the most suitable method.
	CO 3: model the real world scenarios using ODE, PDE.
	CO 4: sense the essential difference between ODE and PDE.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	3	1	2	2	3	2	2	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	2	2	3	2	3

Strongly Correlating(S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

Course Code & Title	19M206 CC IV-Laplace Transforms & Summation of Series			
I B.Sc. Mathematics	Semester : II		Credits : 2	Hrs/ Wk : 3
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 the Laplace Transforms, Binomial Series, Exponential Series and Logarithmic Series.			
Employability and Skill Development	Global Need		Participative Learning, Problem Solving	

UNIT	Content	No. of Hours
I	**Laplace Transforms** Definition – Laplace Transform of Standard Functions.	8
II	**Inverse Laplace Transforms** Inverse Laplace Transforms.	7
III	**Applications of Laplace Transforms** Solution of Ordinary Differential Equations and Simultaneous Equations.	8
IV	**Binomial Series** Binomial Theorem – Some important Particular Case of the Binomial Expansion - Application of the Binomial Theorem to the Summation of Series - Sum of Coefficients.	8
V	**Exponential and Logarithmic Series** The Exponential Theorem – Logarithmic Series-Series which can be summed up by the Logarithmic Series-Application of the Exponential and Logarithmic Series.	8
Reference	**Text Books:** **1.S.Narayanan and T.K. ManicavachagomPillay**, Differential Equations and its Application, S.V. Publications, 2012. **UnitI:**Ch 9(pp.161-178) **Unit II :** Ch 9(pp. 178-189) **Unit III :** Ch 9(pp. 189-199) **2.T.K.ManicavachagomPillay,T.Natarajan, K.S.Ganapathy**, Algebra, Volume I, S.Viswanathan Printer &PublishesPvt. Ltd., 2010. **Unit IV :**Ch 3 : § (5,6,10,11) **UnitV :**Ch 4 : § (2,3,5,7,9,11) **Reference Books:** **1.S. Sangarappan, S. Kalavathy**, Differential Equations and Laplace

	Transforms, Vijay Nicole Imprints Pvt. Ltd., Chennai, 2005. **2.P.R. Vittal**, DifferentialEquations and Laplace Transforms, Margham Publication, 2004. **3**.**P.Kandasamy and K.Thilagavathy**, Mathematics, Volume 1., S. Chand and Company Ltd.,2010.
Course Outcomes	On completion of the course, students should be able to CO 1: acquire the knowledge of transforms and series. CO 2: understand the concept of Laplace transforms and its properties. CO 3: apply the method of finding the solution of differential equation. CO 4: evaluate the summation of power series.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	2	1	2	3	3	2	1	2	1	3	2	2
CO2	3	2	2	2	3	1	2	2	3	2	2	3
CO3	2	2	3	2	1	2	2	3	2	3	2	3
CO4	3	2	3	2	3	1	1	2	3	2	3	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19XM21L SKBC I -MS Office		
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	9
II	**MS WORD** • Mail Merge • Page Formatting and Printing	
III	**MS EXCEL** • Worksheet • Including Formulas • Formatting Cells	9
IV	**MS EXCEL** • Chart Creation • Functions	
III	**MSPOWERPOINT** • Creating Presentation • Sound Animations • Inserting Picture	8
Reference	**Text Book:** **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 Power Point.	

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	3	1	2	2	3	2	2	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	2	2	3	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M308 CC V- Analytical Solid Geometry	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** • gain fundamental ideas about co-ordinate geometry and give clear knowledge about regular geometrical aspects. • giveproperties in two dimensional and three dimensional analytical geometry.		
Employability and Skill Development	Global Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	**Coordinates** The Direction of Rotation – Cylindrical Coordinates – Spherical coordinates (Polar Coordinates) – The Distance Formula – Section Formula – Centroid of a Triangle – Centroid of a Tetrahedron – Projections – Direction Cosines – Direction Ratios – Angle between two lines.	13
II	**The Plane** Equation of a plane – The intercept form – Plane through three given points – Angle between two planes – Points on either side of a plane – Planes bisecting the angles between two given planes – Equation of pair of planes – Projection of a closed plane figure – Area of a planar object – Volume of a tetrahedron.	13
III	**The Straight Line** Symmetrical form of equations of a line – Angle between a line and a plane – Symmetrical form of equations of a line – Constants in the equations of a line – The plane and the straight line – the straight line and the point – Coplanar lines – The shortest distance between two lines – The simplest form of the equations of two lines – Lines intersecting two given lines – Lines intersecting three given lines – Intersecting of three planes.	13
IV	**The Sphere** Equation of a sphere – General form of the equation of a sphere – Conditions satisfied by a sphere – Diameter form – Plane section of a sphere – Intersection of two spheres – Equations of a circle – Sphere through a given circle – Intersection of a sphere and a line – The power of	13

	a point with respect to a sphere – Tangent plane – Plane of contact – Polar plane – Pole of a given plane – Polar lines – Angle of intersection of two spheres – Orthogonally of two spheres – Distance of a point form a sphere – Power of a point and the radical plane – Radical line – Radical centre – Equations of two spheres in the simplest form – Coaxal spheres – Limiting points of a Coaxal system.	
V	**The Cone** Equation of a cone – The enveloping cone – Equation of a cone from a general second degree equation – The right circular cone – The tangent plane – The reciprocal cone – Section of a cone by a plane – Intersection of two cones with a common vertex – Elliptic cones.	13
Reference	**Text Book:** **S. Pirzada and TA Chishti,** Analytical Solid Geometry, Universities Press, 2007. **Unit I :** Ch 1 **Unit II** :Ch 2 **Unit III :** Ch 3 **Unit IV** :Ch 5 **Unit V** :Ch 6 **Reference Books:** **1.T.K.ManicavachagomPillay, T. Natarajan,**A text book of Analytical Geometry, Part II – Three Dimensions, S.Viswnathan Printers and Publishers Pvt., Ltd., 2010. **2. T. K. ManicavachagomPillay, T.Natarajan, K.S. Ganapathy**, Algebra, Volume I, S. Viswanathan Printers and Publishers Pvt., 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 andto find angle between the plane and line, co-planer lines, volume oftetrahedron. 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 ofthe tangent plane. CO 4: demonstrate the binomial theorem for a rational index, applications summation of series and recurring series.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	3	1	2	2	3	2	2	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	2	2	3	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M309A AC IV- Probability Theory		
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	**Baye's theorem and Random variables** Baye's theorem – Random variable: Discrete random variables – Continuous random variable – Two dimensional random variables	16
II	**Mathematical Expectation** Introduction – Mathematical Expectation or Expected value of a random variable – Expected value of function of a random variable – Properties of Expectation – Covariance – Conditional expectation and conditional variance	16
III	**Moment generating function and characteristic function** Moment generating function – Cumulants – Characteristic function	16
IV	**Discrete distribution** Binomial distribution – Poisson distribution – Geometric distribution	15
V	**Continuous distribution** Normal distribution – Rectangular distribution – Gamma distribution – Exponential distribution	15
Reference	**Text Book:** **S.C.Gupta and V.K.Kapoor**, Fundamental of Mathematical statistics, Sultan Chand and sons, New Delhi, 2017. **Unit I** :Ch 4 : § (4.2) ; Ch 5 : § (5.3, 5.4 (5.4.1 – 5.4.3), 5.5 (5.5.1 – 5.5.6)) **Unit II** :Ch 6 : § (6.1 – 6.4, 6.6, 6.9) **Unit III** :Ch 7 : § (7.1, 7.2, 7.3, (7.3.1 – 7.3.2)(without proof)) **Unit IV** : Ch 8 : § (8.4, 8.5, 8.7) **Unit V** :Ch 9 : §((9.2 (9.2.1 – 9.2.11)), (9.3(9.3.1 – 9.3.4)), (9.5(9.5.1 – 9.5.3)) , 9.8)	

	Reference Books:
	P.R.Vittal, Mathematical Statistics, Margham publication,2012.
Course Outcomes	On completion of the course, students should be able to
	CO 1: gaintheknowledge 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.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	1	3	2	3	2	1	3	2	2	3	2	3
CO2	3	2	2	2	3	1	2	2	3	2	2	3
CO3	2	2	3	2	1	2	2	3	2	3	2	3
CO4	2	1	3	2	2	2	3	2	2	2	2	2

Strongly Correlating(S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

Course Code & Title	19M310A AC V – Statistical Methods	Percentage of revision : 40%	
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** • acquire the knowledge of measure of dispersion, correlation, regression and testing of hypothesis.		
Employability and Entrepreneurship	**Global Need**	**Participative Learning, Problem Solving**	

UNIT	Content	No. of Hours
I	**Skewness, Moments and Kurtosis** Measure of skew – Measure of skewness based on moments – Measures of kurtosis	13
II	**Correlation** Karl Pearson's coefficient of correlation – properties of the coefficient of correlation – Rank correlation coefficient	13
III	**Regression** Introduction – Uses of regression analysis – Difference between correlation and regression analysis – Regression lines – Regression equations	13
IV	**Testing of hypothesis** Introduction – Procedure of testing hypothesis – Two types of errors in testing of hypothesis – Two-tailed and one-tailed tests of hypothesis – Measure the power of a hypothesis test – Standard error and sampling distribution – Test of significance for large samples – Tests of significance for small samples	13
V	χ^2 **test and F test** Introduction - χ^2 distribution – Conditions for applying χ^2 test – The F-test or the variance ratio test – Application of F-test – Analysis of variance – Assumption in analysis of variance – Technique of analysis of variance	13
Reference	**Text Book:** **S.C.Gupta**, Statistical Methods, Volume I,Sultan Chand and Sons, 2003. **Unit I :**Ch 9 (pp. 332-335 &pp. 349-375) **Unit II :** Ch 10 (pp. 386-399, pp. 402-415) **Unit III:**Ch 11 (pp. 436-446) **S. C. Gupta**, Statistical Methods, Volume II,Sultan Chand and Sons, 2003.	

	Unit IV:Ch 3 (pp. 882-890, pp. 901-928) Unit V :Ch 4 (pp. 954-959) Ch 5 (pp. 1006-1015) **Reference Books:** **P.R.Vittal**, Mathematical Statistics, Margham Publications, 2012.
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 statisticalinference. CO 3: apply the concept of estimation to the parameter of samplingdistributions. CO 4: evaluate expectation, variance, mgfs, characteristic functions andestimators.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	2	3	2	2	2	3	2	3	2	1	1	2
CO2	2	3	2	3	2	3	1	3	2	3	2	2
CO3	1	2	2	2	3	2	2	3	2	3	2	2
CO4	3	2	2	1	2	2	3	2	3	3	2	3

Strongly Correlating(S) - 3 marks
Moderately Correlating (M) - 2 marks
Weakly Correlating (W) - 1 mark
No Correlation (N) - 0 mark

Course Code & Title	19XM32L SKBC II-SCILAB			
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 and also to meet the global requirements in software industries.			
Employability	Global need		Experiential Learning	

UNIT	Content	No. of Hours
I	• Basic commands • Matrix manipulations	5
II	• Determinants • Polynomials	5
III	• Two dimensional Plots	5
IV	• Multiple plots • Sub plots	6
V	• Three dimensional plots	5
Reference	**Text Book:** **Michael Baudin,** Introduction to SCILAB,TheSCILAB Consortium, 2010. **Reference Book:** **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: understandthe need for simulation /implementation for the verificationof mathematical functions. CO 3: apply simplemathematical functions and operations on using plots. CO 4: analyzevarious SCILAB command.	

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	1	2	3	2	2	1	1	2	2	1
CO2	2	3	2	2	2	3	2	3	2	1	1	2
CO3	2	3	2	3	2	3	1	3	2	3	2	2
CO4	1	2	2	2	3	2	2	3	2	3	2	2

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M411 CC VI - Vector Calculus, Fourier Series & Fourier Transforms		
II B.Sc. Mathematics	Semester : IV	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 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.	13
II	**Vector Integration** Introduction - Line, Surface and volume Integrals and their evaluation.	13
III	**Theorems on Vector Integration** Theorems of Gauss, Stoke's and Green's(statement only) - Problems using these three theorems.	13
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.	13
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.	13
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 III, 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 functionand Fourier Transforms for aperiodic functions.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	2	3	4	5	6	1	2	3	4	5	6
CO1	2	3	3	2	2	2	1	3	4	2	3	2
CO2	2	3	1	2	3	2	2	2	2	3	3	2
CO3	3	1	2	1	3	2	1	2	3	2	3	2
CO4	2	3	2	2	2	3	3	1	3	2	3	2

Strongly Correlating(S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

Course Code & Title	19M412 CC VII - Numerical Methods		
II B.Sc. Mathematics	Semester : IV	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** • provide the knowledge of Numerical Methods for solving the system of algebraic equations, transcendental equations, Interpolation, Numerical Differentiation and Numerical 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 ofsimultaneous Linear Algebraic equations – Gauss Elimination, Gauss-Jordan, Gauss-Jacobi & Gauss-Seidel iterative methods.	13
II	**Newton's Forward and Backward differences** Definition – Forward and Backward differences – Newton's formula for interpolation Operators – Properties and relationship among them – Missing terms & summation of series – Montmort's theorem.	13
III	**Newton's interpolation formula for unequal intervals** Divided differences – Newton's interpolation formula for unequal intervals – Lagranges' interpolation formula – Inverse interpolation.	13
IV	**Numerical Differentiation and Integration** 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)	13
V	**Successive approximation** 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)	13

Reference	**Text Book:** **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 equationusing an appropriate Numerical Methods. CO 2: understand the mathematics concepts underlying the Numerical Methods. CO 3: apply Numerical Methods to obtain approximate solutions tomathematical problems. CO 4: analyze the accuracy of common Numerical Methods. CO 5: evaluate a derivative at a value using an appropriate Numerical Methods.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	3	1	2	2	3	2	2	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	2	2	3	2	3
CO5	3	2	2	2	3	1	2	2	3	2	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M413AL AC VI-R Programming Lab		
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 terms for writing R programme and meet the global requirement in software industries.		
Employability	**Global Need**	**Experiential learning**	

UNIT	Content	No. of Hours
I	1. Basic Mathematical Commands 2. Diagrams	15
II	1. Plotting the curve 2. Measure of Central Tendency	16
III	1. Measure of Dispersion 2. Skewness, Moments and Kurtosis	16
IV	1. Standard Distribution 2. Test of Hypothesis	16
V	1. Correlation 2. Regression	15
Reference	**Text Book:** **Paul Teetor**, R Cook book, O'Reilly Publication, First Edition, 2014. **Reference Book:** **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.	

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	3	1	2	2	3	2	2	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	2	2	3	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 m

Course Code & Title	19M4N1 NMEC I - Quantitative Aptitude I	Percentage of Revision : 80%	
All Programmes except Mathematics	Semester : IV	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** • make the students to clear competitive examinations.		
Employability and Skill Development	**Regional Need**	**Problem solving**	

UNIT	Content	No. of Hours
I	**Operation on Numbers** Introduction – Face value – Place Value – Various types of numbers – Simple problems.	5
II	**HCF and LCM** Factors and Multiplies – HCF and GCD – Factorization Method – Division method – Simple problems.	6
III	**Ratio and Proportion** Ratio – Proportion – Simple problems.	5
IV	**Profit and Loss** Introduction – Cost price – Selling price – Profit and loss – Simple problems.	5
V	**Odd man out and Series** Directions for odd man out and series	5
Reference	**Text Book:** **Aggarwal R.S,** Quantitative Aptitude, S. Chand& Company Ltd., Ram Nagar, New Delhi, 2013. **Unit I** : Ch 1 : § (1- 6) **Unit II** : Ch 2 : § (1, 2) **Unit III :** Ch 12 : § (1, 2) **Unit IV :** Ch 11 **Unit V** : Ch 35 **Reference Books:** **1. AbhijitGuha**, Quantitative Aptitude for Competitive Examinations, McGraw Hill Education (India) Pvt. Ltd., New Delhi, Fifth Edition, 2014. **2.N.K.Singh**, Quantitative Aptitude Test, UpkarPrakashan, 2012.	
Course	On completion of the course, students should be able to	

Outcomes	
	CO 1: acquire the meaning of HCF and LCM of numbers.
	CO 2: understand the concepts of odd man out & series.
	CO 3: analyze the concepts of ratio & proportion.
	CO 4: apply the concepts of profit & loss in real life problems.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	2	3	4	5	6	1	2	3	4	5	6
CO1	3	2	2	2	1	3	2	2	1	1	3	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	3	2	2	2	3	1	2	2	3	2	2	3

Strongly Correlating(S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

Course Code & Title	19M514 CC VIII-Modern Algebra		
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 a first approach to the subject of Algebra 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.	16
II	**Normal groups and Homomorphism** Normal subgroups and Quotient groups – Homomorphisms – Automorphisms – Cayley's Theorem.	16
III	**Rings** Definition and Examples of Rings – Some special classes of Rings – Homomorphisms – Ideal and Quotient Rings	16
IV	**Vector Space** Elementary Basic concepts – Linear Independence and Bases – Dual Spaces – Inner Product Spaces.	15
V	**Field** Extension Fields – The Transcendence of e – Roots of Polynomials.	15
Reference	**Text Book:** **I.N. Herstein**, Topics in Algebra, Wiley Student Edition, Second Edition, 2011. **UnitI:**Ch 2 : § (2.1-2.5) **Unit II:**Ch 2 : § (2.6-2.9) **Unit III:**Ch 3 : § (3.1-3.4) **Unit IV:**Ch 4 : § (4.1-4.4) **Unit V:**Ch 5 : § (5.1-5.3) **Reference Books:** **1. S. Kumaresan**, Linear Algebra - A Geometric Approach, PHI Learning Pvt. Ltd., 2010. **2. John.B. Fraleigh**, A first course in Abstract Algebra, Seventh Edition, 2002.	

	On completion of the course, students should be able to
Course Outcomes	CO 1: gain the knowledge about concepts of sets, mapping, relations and usesome basic definition of groups & subgroups. CO 2: understandthe importance of algebraic properties with regard to workingwithin 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.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	2	3	3	2	2	2	1	3	4	2	3	2
CO2	2	3	1	2	3	2	2	2	2	3	3	2
CO3	3	1	2	1	3	2	1	2	3	2	3	2
CO4	2	3	2	2	2	3	3	1	3	2	3	2

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M515 CC IX- Real Analysis I		
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** • gain the basic knowledge of real analysis. • impart the depth knowledge offunctions, 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.	16
II	**Properties of Real numbers** The completeness property of R-Applications of supremum property –Intervals.	15
III	**Sequences** Sequence and their limits – Limit theorems – Monotone sequences –Sub sequences – Bolzano Weierstrass theorem – Cauchy criterion –Properly divergent sequences.	16
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).	16
V	**Infinite Series contd.,** Tests for absolute and non- absolute convergence.	15
Reference	**Text Book:** **Robert G.Bartle**, **Donald R.Sherbert**, Introduction to Real Analysis, Third Edition, Wiley India 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), Ch 9 : § (9.1) **Unit V:**Ch 9 : § (9.2, 9.3)	

	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.
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, subsequence and divergent sequence. CO 3: apply the limit of various function. CO 4: analyze the extension of limit concepts.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	1	3	2	2	1	3	2	2	1	3
CO2	2	3	2	1	3	2	2	1	3	2	1	3
CO3	3	2	2	1	3	3	2	1	3	3	3	2
CO4	2	3	2	3	2	2	3	3	2	3	3	2

Strongly Correlating(S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

Course Code & Title	19M516 CC X-Mechanics		
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** • provideknowledge 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.	16
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.	16
III	**Projectiles** Projectiles– Path of a projectile - Characteristics of the motion of a projectile -Velocity of the projectile - Range of an inclined plane.	15
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 impact of two	15

	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.	16
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, LaxmiDuraipandian, MuthamizhJayapragasam**, 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.	

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	3	2	3	2	1	3	3	2	2	2
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	2	2	3	2	3

Strongly Correlating(S)	-	3 marks	
Moderately Correlating (M)	-	2 marks	
Weakly Correlating (W)	-	1 mark	
No Correlation (N)	-	0 mark	

Course Code & Title	19M517 CC XI - Graph Theory	Percentage of Revision : 100%	
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** • introduce the basic concept and essentials of Graph Theory.		
Employability	**Global Need**	**Participative Learning, Problem Solving**	

UNIT	Content	No. of Hours
I	**Graphs** Varieties of graphs – Walks and connectedness – Degrees – The problem of Ramsey – External graphs – Intersection graphs – Operations on graphs.	13
II	**Blocks and Trees** Cut points, bridges and blocks – Block graphs and cut points graphs – Characterization of Trees – Centers and Centroids – Block cutpoint trees .	13
III	**Connectivity and Partitions** Connectivity and line connectivity – Graphical variations of Menger's theorem – Further variations of Menger's theorem – Partitions.	13
IV	**Traversability and Line graphs** Eulerian graphs – Hamiltonian graphs – Some properties of line graphs – Line graphs and traversabilty – Total graphs.	13
V	**Factorization and Converges** 1-Factorization – 2-Factorization – Arboricity – Coverings and independence – Critical points and lines – Line-core and point-core.	13
Reference	**Text Book:** **Frank Harary**, Graph Theory, Narosa Publishing House, Third Edition, 1990. **Unit I :**Ch 2 **Unit II :**Ch 3 , Ch4 **Unit III :**Ch 5, Ch6 **Unit IV :** Ch7, Ch 8 **Unit V :** Ch 9, Ch 10 **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, Second 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: understandthe 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 CO 5: analyze the concept of Factorization and converges.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	3	1	2	2	3	2	2	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	2	2	3	2	3
CO5	3	2	2	2	3	1	2	2	3	2	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M5N2 NMECII - Quantitative Aptitude II	Percentage of Revision : 40%	
All Programmes except Mathematics	Semester : V	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** • make the students to clear competitive examinations.		
Employability and Skill Development	Regional Need	Problem solving	

UNIT	Content	No. of Hours
I	**Percentage** Introduction – Important facts and family – Concept of percentage – Simple problems.	6
II	**Simplification** Introduction – BODMAS rule – Modulus of a real number – Simple problems.	5
III	**Problems on ages** Problems on ages - Simple problems.	5
IV	**Time and Work** Time and Work - Simple problems.	5
V	**Problems on Trains** Problems on Trains with solved examples.	5
Reference	**Text Book:** **Aggarwal R.S,** Quantitative Aptitude, S.Chand& Company Ltd.,New Delhi, 2013. **Unit I:**Ch 10 **Unit II:**Ch 4 **Unit III :**Ch 8 **Unit IV :**Ch 15 **Unit V:**Ch 18 **Reference Books:** **1. AbhijitGuha**, Quantitative Aptitude for Competitive Examinations, McGraw Hill Education (India) Pvt. Ltd., New Delhi, Fifth Edition, 2014. **2.N.K.Singh**, Quantitative Aptitude Test, UpkarPrakashan, 2012. **3.U.MohanRao**, Quantitative Aptitude for Competitive Examinations, SCITECH Publications, 2012.	

	On completion of the course, students should be able to
Course Outcomes	CO 1: gain the knowledge of basic algebraic formulas. CO 2: understandthe formulation of problem quantitatively and using appropriate arithmetical and statistical methods to solve the problems. CO 3: apply the concept of time and work in real life problems. CO 4: analyzethe problem on trains with solved examples.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	2	3	4	5	6	1	2	3	4	5	6
CO1	2	1	3	2	3	2	2	2	3	1	3	2
CO2	2	3	2	2	1	3	2	2	3	2	2	3
CO3	3	2	2	1	2	1	3	2	2	3	2	2
CO4	1	2	3	1	2	3	2	2	2	1	3	2

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M619 CC XII - Real Analysis II		
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** • equipthe students for study in real analysis by introducing further some of advanced topics in real analysis.		
Employability	Global Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	Limits of functions – Limit theorems – Extensions of the limit concepts.	15
II	Definitions – Combination of continuous function – Continuous function on intervals – Uniform continuity: Definitions – Non-uniform continuity criteria – Theorems.	16
III	Lipschitz functions – Monotone and Inverse functions – Differentiation: The derivative – Chain rule.	15
IV	Inverse function – The Mean Value theorem – Intermediate Value Property of Derivatives – Darboux's theorem – Taylor's theorem and its application – Relative Extrema – Convex functions.	16
V	The Riemann Integral – Riemann Integral functions – The Fundamental theorem.	16
Reference	**Text Book:** **Robert, G. Bartle, Donald R. Sherbert**, Introduction to Real Analysis, Third Edition. **Unit I :** Ch 4 : §(4.1 – 4.3) **Unit II:** Ch 5: §(5.1-5.4.3) **Unit III:** Ch 5: §(5.4.4-5.4.6,5.6.1-5.6.5), Ch 6 : § (6.1.1 – 6.1.7) **Unit IV :** Ch 6: §(6.1.8-6.2.12, 6.4.1-6.4.6) **Unit V :** Ch 7: §(7.1-7.2, 7.3.1 - 7.3.9) **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 (Unit IV). 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 relatedtheorems. 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 importantpractical problems.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	1	2	2	3	2	3	1	2	2	3	2	3
CO2	3	2	1	2	2	3	2	2	2	3	2	3
CO3	1	2	2	3	2	3	1	2	3	2	3	1
CO4	3	2	1	2	2	3	2	2	3	2	3	1
CO5	2	3	2	3	2	3	2	3	2	2	3	2

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M620 CC XIII- Complex Analysis		
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** • provide an introduction of functions of complex variable. • gainknowledge 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.	16
II	**Elementary and Conformal Mappings** Bilinear Transformation – Circles and Inverse points – Transformation for z^2, $z^{\frac{1}{2}}$, $z + \frac{1}{z}$, e^z, log z , sin z , cos z – Conformal mapping – Examples.	15
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.	16
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.	16
V	**Residues** Definitions – Calculation of Residues – Real definite integrals – Examples.	15
Reference	**Text Book:** **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: study the nature of singularities and calculating residues.
CO 5: analyze the applications of Complex Analysis. |

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	1	3	2	2	3	3	1	2	2	2	3	3
CO2	3	2	3	1	2	2	2	2	2	1	2	3
CO3	1	2	2	2	3	3	2	2	2	2	3	1
CO4	3	3	2	1	2	2	2	1	2	2	3	1
CO5	2	3	2	3	2	3	2	2	3	3	3	2

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M621 CC XIV - Discrete Mathematics		
III B.Sc. Mathematics	Semester : VI	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** • acquire the basic knowledge in Propositional and Predicate Calculus • gain the knowledge in Lattices with its properties and Boolean Algebra		
Employability and Skill Development	**Global Need**	**Participative Learning, Problem solving**	

UNIT	Content	No. of Hours
I	**Propositional Calculus** Statement and notations – Connectives and truth tables – Normal forms – Theory of inference for the statement Calculus	13
II	**Predicate Calculus** Inference theory – Nested quantifiers – Proof techniques	13
III	**Relations** Relations – Relation matrix and the graph of a relation – Equivalence relations – Partition of a set – Composition of relations – Partial ordering.	13
IV	**Lattices** Definitions and examples – Properties – Sub Lattices – Direct product lattice homomorphism and isomorphism – Some special lattices.	13
V	**Boolean Algebra** Definitions and examples – Basic Law – Boolean expression and Boolean functions.	13
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) **Unit III :** Ch 4 : §(4.3-4.8) **Unit IV :** Ch 5 : §(5.1.1-5.1.6) **Unit V** : Ch 5 : §(5.2.1-5.2.3)	

	Reference Books:
	1. J.P.Trembly, R.Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tala MC Graw-Hill Publishing Co.Ltd., New Delhi,2007.
	2. N.Chandrasekaran, M.Umaparvathi, Discrete Mathematics, PHI learning Pvt. Ltd., New Delhi,2010.
	3. Ralph P.Grimaldi, B.V.Ramana, Discrete and Combinatorial Mathematics,(An Applied Introduction), Pearson, Fifth 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 andindirect proof form, proof by contradiction and mathematical induction. CO 4: analyze logic sentence in terms of predicates, quantifiers and logicalconnectives. CO 5: evaluate Boolean functions and simplify expression using the properties of Boolean Algebra.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	3	1	2	2	3	2	2	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	2	2	3	2	3
CO5	3	2	2	2	3	1	2	2	3	2	2	3

Strongly Correlating(S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

Course Code & Title	19M622 CC XV - Mathematical Modeling		
III B.Sc. Mathematics	**Semester : VI**	**Credits : 2**	**Hrs/ Wk : 3**
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 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.	8
II	Mathematical modeling in Population Dynamics - Modeling of Epidemics.	8
III	Modeling through Linear Differential equations	7
IV	Some simple models on basic theory of Linear Difference equations	8
V	Graph models - Models in terms of Directed graph, Signed graph and Weighted Digraphs**.**	8
Reference	**Text Book:** **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,PragatiPrakashan, FirstEdition, 2006. 2. **Bhupendra Singh**, Bio Mathematics,KrishnaPrakashan Media,2005. 3. **J.N. Kapoor** Mathematical modelling in Biology and Medicine, East West Press, 1985.	
Course Outcomes	On completion of the course, students should be able to CO 1: acquire the knowledge of model through graphs.	

	CO 2: understand the concept of mathematical modeling through ordinary differential equations. CO 3: apply some models on basic theory of linear difference equations. CO 4: analyze a problem formulate it as a mathematical model containing ordinary differential equation.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	3	1	2	2	3	2	2	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	2	2	3	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M518bT/L EC I - Programming in C with lab	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** • learn Basics of C, Control structures, Functions, Pointers and File Handling.		
Employability	Global Need	Participative Learning, Problem Solving	

UNIT	Content	No. of Hours
I	**Data Type, Operators and Expressions** Evolution and applications of C-Structure of C Program – Data types – Declaration – Operators – Expressions – Built – in functions. **C Programming Lab** 1. Solution of a Quadratic equation. 2. Sum of Series (sine, cosine,e^x)	13
II	**I/O Operations and Decision Making** Data Input and Output – Control Statements – If else – else if ladder- GOTO- Switch – while – Do while - For – Break and Continue. **C Programming Lab** 1. Ascending and Descending order of numbers using Arrays(Use it to find Largest and Smallest Numbers) 2. Sorting of names in Alphabetical order.	13
III	**Functions and Arrays** Functions – Definition – Accessing functions – Storage classes – Arrays – Passing arrays to functions – Strings – String functions - String Manipulation. **C Programming Lab** 1. Finding factorials, generating Fibonacci numbers using recursive functions. 2. Finding mean, median, mode and standard deviation.	13
IV	**Pointers** Pointers – Pointer Declaration- Operations on Pointers - Pointers to functions – Pointers and string – Pointers and arrays – Array of Pointers – Structures	13

	– Structures and Pointer Unions. **C Programming Lab** 1. Newton – Raphson, Bisection Method of solving equations. 2. Trapezoidal rule, Simpson`s 1/3 rule of integration.	

V	**File Management**
	Opening, Closing andProcessing data files.
	C Programming Lab
	   1. Lagrange's Method of interpolation.
	   2. R-K fourth order method for solving Differential equations.
		13

Reference	**Text Book:** **E. Balagurusamy**, Programming in 'C',Tata Mc. Graw Hill Publication Sixth Edition, 2008. **Unit I** : Ch1 : § (1.8), Ch 2 : § (2.7-2.9), Ch 3 : § (3.2-3.16) **Unit II** : Ch4 : § (4.4,4.5), Ch 5 : § (5.2-5.9), Ch 6 : § (6.2-6.4) **Unit III :** Ch7 : § (7.2-7.7), Ch 9 : § (9.2-9.9,9.17,9.18) **UnitIV:**Ch10 : § (10.2,10.8,10.9,10.12), Ch 11 : § (11.4,11.5,11.10-11.12,11.15,11.16) **Unit V** : Ch12 **Reference Books:** 1. **Ron Gotlfried and Schaum's**, Programming in C , Tata McGraw Hill Publications, 2002. 2. **Mulish Coopers Schaum**, The Split of C, Tata McGraw HILL Publications, 2004. 3. **YeshwanthKanetkar**, Let us C, BPB Publications, 2005.	
Course Outcomes	On completion of the course, students should be able to CO 1: acquire the knowledge of the structure of C programming languageand it development. CO 2: understand the structured programming language C CO 3: apply the concepts of point and array. CO 4: analyze the use of structured programming in numerical problemsolving.	

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	2	1	3	2	3	2	2	2	3	1	3	2
CO2	2	3	2	2	1	3	2	2	3	2	2	3
CO3	3	2	2	1	2	1	3	2	2	3	2	2
CO4	1	2	3	1	2	3	2	2	2	1	3	2

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks

Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M518a EC I - Fuzzy Theory		
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** • introduce the concepts of fuzzy sets and fuzzydecision making.		
Employability and Skill Development	Global 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.	13
II	Introduction - Important theorems- Extension principle for fuzzy sets-Fuzzy compliments-Further operations on Fuzzy sets.	13
III	Introduction-Projection and cylindrical fuzzy relations- Composition-Properties of Min-Max compositions-Binary relations on a single set.	13
IV	Introduction-Fuzzy measures-Evidence theory probability measure-possibility and necessity measures.	13
V	Introduction-individual decision making-multiperson decision making-multi-criteria decision making-Fuzzy ranking method.	13
Reference	**Text Book:** **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 Book:** **George J. Klir and Bo Yuan,** Fuzzy Sets and Fuzzy Logic Theory and Applications, PHI, New Delhi, 2002.	
Course	On completion of the course, students should be able to	

Outcomes	
	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: analyze statistical data by using fuzzy logic method.
	CO 5: evaluate fuzzy statistics applications.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	2	3	4	5	6	1	2	3	4	5	6
CO1	2	3	2	2	3	1	2	2	3	2	2	3
CO2	3	2	3	2	1	2	2	3	2	3	2	3
CO3	2	2	3	2	3	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	3	2	3	2	3
CO5	3	2	2	2	3	1	2	2	3	2	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M623b EC II - Operations Research		
III B.Sc. Mathematics	Semester : VI	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** • introduce the fundamentals of Operations Research Models including linear programming and applications.		
Employability and Skill Development	Global Need	Participative Learning, 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.	13
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.	13
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.	13

	Sequencing Problem	
V	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 – Replacement of Equipment/Asset that Deteriorates Gradually – Replacement of Equipment that fails suddenly.	13
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.	13
Refere nce	**Text Book:** **Kantiswarup, P.K. Gupta &Manmohan**, Operation Research, Sultan Chand and Sons, Sixteenth 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.	
Cours e Outco mes	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 controlproject activities.	

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	3	1	2	2	3	2	2	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	2	2	3	2	3
CO5	3	2	2	2	3	1	2	2	3	2	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M623a EC II - Astronomy		
III B.Sc. Mathematics	Semester : VI	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** • introduce the basics of Astronomy. • learn about the moon and Eclipses.		
Employability and Skill Development	Global Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	Celestial sphere and diurnal motion – Celestial co-ordinates – Siderel time.	13
II	Morning and Evening stars – Circumpolar stars – Zones of Earth – Perpetual day – Twilight.	13
III	Refraction – Laws of Refraction – Tangent formula – Horizontal Refraction – Geocentric parallax.	13
IV	Kepler's laws – Anomalies – Kepler's equations – Calendar.	13
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.	13
Reference	**Text Book:** **Kumaravel.S and SusheelaKumaravel**, Astronomy, S.K.V Publication, Eighth edition, 1993. **Unit I :**(pp. 39-79) **Unit II :**(pp. 80-90, pp. 106-116) **Unit III :** (pp. 117-144) **Unit IV :**(pp. 146-162, pp. 173-178) **Unit V :**(pp. 229-241, pp. 256-275) **Reference Book:** **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 to use mathematics to perform calculations onearth and/ or space science problems. CO 2: understand the use of our galaxy to contrast and compare it with other galaxies as to type, content, age, luminosity, motion and size.	

	CO 3: apply the principle findings, common applications, current problems,fundamental techniques and underlying theory of the astronomy. CO 4: analyze the size, age structure and motion of the universe over all using cosmological models.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	2	2	3	2	1	2	2	3	2	3	2	3
CO2	2	1	3	2	2	2	3	2	2	2	2	2
CO3	1	3	2	3	2	1	3	2	2	3	2	3
CO4	3	2	2	2	3	1	2	2	3	2	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19M624bT/L EC III - Object Oriented Programming in C++ with Lab	Percentage of Revision : 100%	
III B.Sc. Mathematics	Semester : VI	Credits : 5	Hrs/ Wk : 5
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understand **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The course aims to** • learn the basic concepts of OOPs , Class , control structures, functions and Inheritance		
Employability	Global Need	Participative Problem Solving	Learning,

UNIT	Content	No. of Hours
I	**Principles of object Oriented Programming** Basic Concepts of Object Oriented Programming-Benefits of OOP-Applications of OOP-Structure of C++ Program. **Tokens, Expressions and Control Structures**Introduction -Tokens-Keywords-Identifiers and constants-basic data types-User defined data types-Derived data types-Symbolic constants-type compatibility -Declaration of variables-Dynamic initialization of variables-Reference variables-Operators in C++ -Scope resolution operators-Manipulators- type cast operator-expressions and their type-Special assignment expressions-implicit conservations-operator over loading-operator precedence-control structures.	12
II	**Functions in C++** Introduction - The main function-Function prototyping –Call by reference-return by reference inline functions-default arguments-constant arguments-function over loading-friend and virtual functions-math library functions. **Managing Console I/O operations** Introduction-C++ streams-C++stream classes-unformatted I/O operations-Formatted I/O operations-Managing output with manipulators.	10

III	**Classes and Objects** Introduction -C Structures Revisited-Specifying a class-Defining Member Functions-A C++ Program with class-Making an outside Function Inline-Nesting of Member Functions-Private Member Functions-Arrays within a class memory Allocation for Objects – Static Data Members-Static Member Functions-Arrays of Objects-Objects as Function Arguments-Friendly functions –Returning Objects-Constant Member Functions.	10
IV	**Constructors and Destructors** Introduction –Constructors-Parameterized Constructors-Multiple Constructors in a class-Constructors with Default Arguments-Dynamic Initializations of Objects-Copy Constructor-Constructing Two dimensional arrays-Constant Objects-Destructors. **Operators Overloading and TypeConversions**Introduction –Defining Operator Overloading-Overloading unary Operators-Overloading Binary Operators-Overloading Binary Operators Using Friends-manipulating of strings Using Operators-Rules of overloading Operators.	10
V	**Inheritance – Extending Classes** Introduction-Defining Derived Classes-Single inheritance-Making a private Member Inheritable-Multilevel Inheritance-Multiple Inheritance-Hierarchical Inheritance-Hybrid Inheritance-Virtual Base Classes-Abstract Classes-Constructors in Derived Classes-Member Classes: Nesting of Classes.	10
C++ Programming Lab	**Programs implementing** 1. Classes and Objects 2. Constructors and Destructors 3. Function Overloading 4. Operator Overloading 5. Basics of Inheritance	26
Reference	**Text Book:** **E.Balagurusamy** ,Object Oriented Programming with C++, Tata McGraw Hill-Publishing Company Ltd., Fifth Edition, 1999. **Unit I :** 1.5-1.8,3.1-3.6,3.8-3.25 **Unit II :** 4.1-4.12,10.1-10.6 **Unit III :** 5.1-5.17	

	Unit IV : 6.1-6.11,7.1-7.6,7.8
	Unit V : 8.1-8.12
	Reference Books:
	1. **Robert Lafore** ,Object Oriented Programming in Turbo C++ ,Galgotia Publications Pvt.Ltd.,New Delhi, 2001.
	2. **D. Ravichandran** , Programming with C++ , Tata MC Graw , Hill Publishing Company Ltd., New Delhi, 2002.
	3. **YashwantKanethkar** ,Let us C++ - BPB Publishers, New Delhi, 2004.
Course Outcomes	On completion of this course, students should be able to
	CO 1: gain knowledge about the structure and model of the C++ programming language.
	CO 2: understand C++ programming language by using various programming techniques.
	CO 3: apply C++ programs to solve simple problems. develop some software based on mathematics problems in the C++ programming language.
	CO 4: evaluate user requirements for software functionality required to decide whether the C++ programming language can meet user requirements.
	CO 5: analyze the uses of certain techniques by implementing them in the C++ programming language to solve the given problem.

Mapping of COs with POs & PSOs:

CO	PO						PSO					
	1	2	3	4	5	6	1	2	3	4	5	6
CO1	S	M	M	M	S	W	M	M	S	M	M	S
CO2	M	M	S	M	W	M	M	S	M	S	M	S
CO3	M	W	S	M	M	M	S	M	M	M	M	M
CO4	W	S	M	S	M	W	S	M	M	S	M	S
CO5	S	M	W	M	S	M	M	M	S	M	M	M

Strongly Correlating(S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

Course Code & Title	19M624a EC III - Number Theory		
III B.Sc. Mathematics	Semester : VI	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 • introduce some basic concepts of Number Theory.		
Employability and Skill Development	Global Need	Participative Problem solving	Learning,

UNIT	Content	No. of Hours
I	The Division algorithm -The Greatest Common Divisor-The Euclidean algorithm –TheDiophantine equation $ax+ by=c$ -Primes and their distributions:Thefundamental theorem of Arithmetic -The sieve of Eratosthenes.	13
II	The Goldbach Conjecture -Carl Friedrich Gauss-Basic properties of congruence- Binary and Decimal Representation of integers - Linear congruence and the Chinese Remainder Theorem.	13
III	Fermat'stheorem-Fermat'sLittletheoremandPseudo primes-Wilson'stheorem-TheFermatKraitchik Factorizationmethod.	13
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	13
V	Continued Fractions: Finite continued Fractions-Infinite continued Fractions.	13
Reference	**Text Books:** **David M.Burton**, Elementary Number Theory, Seventh Edition, TATA McGraw -Hill Publishing Company Ltd., New Delhi, 2012. **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.IvanNiven,HerbertS.Zuckerman,HughL.Montgamery,**AnIntroductiontoTheoryof Numbers, Fifth Edition, Wiley IndiaEdition,2006. **2.M.Apostol,**IntroductiontoAnalyticNumberTheory,EighthEdition,SpringerInternationalStudent Edition, 1998. **3.Bruce C. Berndt** Number Theory in the spirit of Ramanujan, Published by American Mathematical Society (IndianEdition), 2000. **4.George E. Andrews,**Number Theory, HindustanPublishing 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: applyEuclid's algorithm and backwards substitution. CO 4: analyze learning methods and techniques used in number theory. CO 5: evaluate multiplicative inverse, modulo n and use to solve linear congruence.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	3	1	2	2	3	2	2	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	2	2	3	2	3
CO5	3	2	2	2	3	1	2	2	3	2	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19P103A/19Y103A AC I - Allied Mathematics I		
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** • introduce the concepts of Binomial, Exponential, Logarithmic series, Theory of Equations, Matrices, Multiple Integrals and Fourier series.		
Employability and Skill Development	Global Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	**Summation of series** Binomial theorem – Exponential theorem – The Logarithmic series	10
II	**Theory of Equations** An expression of the form – Fundamental theorem of Algebra – Symmetric function of the roots – Formation of Equation – To diminish the roots of an equation by h.	11
III	**Matrices** The Characteristics equations of a transformation – Properties of the Eigen vectors (without proof) – Cayley Hamilton theorem – Unitary and orthogonal matrix.	11
IV	**Multiple Integrals** Multiple integrals – Double Integral – Change by variables – Triple integral – Applications.	10
V	**Fourier series** Fourier series – Dirichlet's conditions	10
Reference	**Text Books:** **1.P.Kandasamy, K.Thilagavathy,** Allied Mathematics, Volume I, S.Chand& Company, 2003. **Unit I** : Ch 1 : § (2, 3, 4) **Unit II** : Ch 2 : § (1) **Unit III** : Ch 3 : § (4,5) **2.P.Kandasamy, K.Thilagavathy,** Allied Mathematics, Volume II, S.Chand& Company, 2004. **Unit IV :**Ch 1 : § (4) **Unit V :**Ch 1 : § (6)	

	Reference Books: 1. **T.K.ManicavachagomPillay, T.Natarajan, S.Ganapathy,** Algebra, S.V.Publication, 1999. 2. **B.S.Grewal,** Higher Engineering Mathematics, Thirty Sixth Edition,Khanna Publishers, 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

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	1	3	2	2	1	1	3	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	3	2	2	2	3	1	2	2	3	2	2	3

Strongly Correlating(S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

Course Code & Title	19P104A/19Y104A AC II -Allied Mathematics II		
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** • acquire the knowledge insuccessive derivatives, Jacobians, curvature, Maxima and Minima of a functions of two variables, Expansion of Trigonometric ratio,Hyperbolic functions, Newton's and Lagrange's interpolation in finite differences.		
Employability and Skill Development	Global Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	**Successive Derivatives** Derivatives of standard form – Leibnitz's theorem.	10
II	**Jacobians and curvature** Jacobians – Curvature – Radius of curvature in Cartesians – Parametric form.	10
III	**Maxima and minima of a function of two variables** Maxima and minima of a function of two variables – Lagrange's method of undetermined multipliers.	11
IV	**Trigonometry** Expand $\sin^n \theta$, $\cos^n \theta$ - Expansion of $\cos n\theta\, and \sin n\theta$ in powers of $\sin \theta$ and $\cos \theta$ - Expansion of $\sin\theta$, $\cos \theta$ and $\tan\theta$ in powers of θ - Circular functions in terms of Exponential – Hyperbolic functions – Relations connectivity hyperbolic functions and circular functions – Inverse hyperbolic functions.	11
V	**Finite Differences** Interpolations: Newton's forward, backward interpolations – Lagrange's interpolation	10
Reference	**Text Book:** **P.Kandasamy, K.Thilagavathy,** Allied Mathematics, Volume I, S. Chand & Company, 2003. **Unit I :** Ch 6 : § (1) **Unit II :** Ch 6 : § (2,4) **Unit III :**Ch 6 : § (5) **Unit IV :**Ch 5 : § (1,2)	

	Unit V : Ch 4 : § (2,3)
	Reference Books: 1.**P.R.Vittal**, Allied Mathematics, MarghamPublications,Third Revised Edition, 2002. **2. T.K.ManicavachagomPillay, T.Natarajan, S.Ganapathy,** Algebra, S.V.Publication, 1999. **3.S. S. Sastry**, Introductory Methods of Numerical Analysis, PHI, 1995.
Course Outcomes	On completion of the course, students should be able to CO 1: recollect basic concepts of Differentiation and Trigonometry. CO 2: understanding about the concept of successive derivatives, Leibnitz's theorem, Jacobians and curvature and maxima and minima of a function of two variables. CO 3: get an idea about trigonometric functions $\sin^n\theta$, $\cos^n\theta$, expansion of $\cos n\theta$ and $\sin n\theta$ in powers of $\sin\theta$ and $\cos\theta$, Hyperbolic functions and Inverse Hyperbolic functions. CO 4: solving the polynomial equations using interpolating methods: Newton's forward, backward and Lagrange's methods.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	2	3	2	1	2	2	3	3
CO2	2	3	2	2	3	2	1	2	2	3	2	3
CO3	2	3	2	3	2	1	2	2	3	2	2	2
CO4	3	2	1	3	2	2	2	3	2	2	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19P206A/19Y206A AC III - Allied Mathematics III		
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** • provide knowledge about the concepts of Total Differential Equations, Partial Differential Equations Laplace Transforms, Differential and Integration of vector.		
Employability and Skill Development	**Global Need**	**Participative Learning, Problem solving**	

UNIT	Content	No. of Hours
I	**Total Differential Equations** Total differential equation (Pdx+Qdy+Rdz=0) - Necessary and Sufficient conditions for integrability - General methods of solving the equation - Solution of the total differential equation.	13
II	**Partial Differential Equations** Formation of differential equations-Elimination of arbitrary constants and arbitrary functions-Solution of partial Differential equations-Find the singular integral and general integral-Solution of partial differential equations by direct integration-Methods of solve the first order partial differential equations.	13
III	**Laplace Transforms** Laplace transforms-Linear property-First Shifting theorem-Inverse Laplace Transforms – Laplace transforms of derivative of integrals.	13
IV	**Differentiation of Vectors** Derivative of a vector-Gradient, Divergence and Curl-Directional Derivative-Second Order differential operators.	13
V	**Integration of Vectors** Integration as inverse of differentiation-The line integral-Surface integral-Green's theorem in the plane-Gauss's Divergence theorem-Stoke's theorem(Simple Problems only)	13

	Text Book:
Reference	**P.Kandasamy, K. Thilagavathi,**AlliedMathematics,Volume II, S.Chand& Company, 2003. **Unit I :**Ch 2 : § (2) **Unit II :**Ch 3 : (pp. 186 - 212) **Unit III :**Ch 4 : (pp. 234 - 273) **Unit IV :**Ch 5 : § (1, 2) **Unit-V :**Ch 5 : § (3) **Reference Books:** **1.P.R.Vittal,**AlliedMathematics,MarghamPublications,Third Revised Edition,2002. **2.M.K.Venkatraman,**Engineering Mathematics,NPC,1998.
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.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	1	3	2	2	1	1	3	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	3	2	2	2	3	1	2	2	3	2	2	3

Strongly Correlating(S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

Course Code & Title	19S103A AC I - Basic Mathematics		
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	Global 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	13
II	Successive differentiation-Leibnitz's theorem and its applications-Integration by parts – Definite integrals and its properties	13
III	To solve the second order differential equations when the RHS is of the type e^{kx}, sinkx , coskx , x^k, $e^{ax}x$.	13
IV	Definition of Laplace transform - Laplace transforms of e^{at},cos at, cosh at , 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.	13
V	Definition of Fourier series- Finding Fourier constants for periodic function with period 2π - odd and even functions-Half-Range series.	13
Reference	**Text Books:** 1. **S. Narayanan, T.K. ManicavachagomPillay,** Ancillary Mathematics,Volume I, S.V.Publications, 2012. (Unit I,II) 2. **S. Narayanan, T.K. ManicavachagomPillay,** Ancillary Mathematics,Volume II, S.V.Publications, 2012. (Unit II,IV,V) 3. **S.Narayanan,T.K. ManicavachagomPillay,** Calculus, Volume III, S.V.Publications, 2010.(Unit III) **Reference Books:** 1. **M.K.Venkataraman,** Engineering mathematics,NPC,1998	

	2. 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}, $\sin kx$, $\cos kx$, 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.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	1	1	3	3	2	2	1	2	3	1
CO2	3	2	2	1	2	3	2	1	1	3	3	2
CO3	2	3	2	3	2	1	1	3	3	2	1	3
CO4	2	3	2	1	1	3	3	3	2	3	3	3

Strongly Correlating(S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

Course Code & Title	19S104A AC II- Operations Research		
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** • 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	11
II	**Transportation problem (TP)** Introduction – Solution of a TP: Finding an Initial Basic Feasible Solution (IBFS) – Test for Optimality – Degeneracy in TP – Unbalanced TP- Assignment Problem (AP): Introduction – Hungarian Method for finding the solution of AP- Unbalanced AP	11
III	**Network** Introduction-Basic Components-Rules of Network Construction –Critical Path Analysis- Measure of activity – PERT computations –CPM computation-Difference between PERT and CPM	10
IV	**Sequencing Problem (SP)** Introduction- Basic Terms Used in Sequencing-Processing of n jobs through two machines – Processing of n jobs through three machines – Processing of two jobs through m machines	10
V	**Inventory Control** Introduction – Cost associated with inventories – factors affecting inventory control – EOQ: the concept of EOQ – Deterministic inventory problem with no shortages and with shortages.	10

Reference	**Text Books:** **1. A.Taha**,OperationsResearch**,**Keerthi Publishing House, 1997. (Unit I) **2. KantiSwarup**, **P.K.Gupta**, **Man Mohan,** Operations Research**,** Sultan Chand &Company Ltd, 11th Edition, 2003. (Unit II,III,IV and V) **Reference Book:** **Prem Kumar Gupta and 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.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	2	1	2	3	2	3	2	2	1	2	3	1
CO2	3	2	2	1	2	3	2	1	2	3	3	2
CO3	2	3	2	3	2	2	1	2	1	2	3	2
CO4	2	2	1	2	3	2	2	1	2	3	2	3

Strongly Correlating(S)	-	3 marks
Moderately Correlating (M)	-	2 marks
Weakly Correlating (W)	-	1 mark
No Correlation (N)	-	0 mark

Course Code & Title	19S207A ACIII- Numerical and Statistical Methods		
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** • provide the techniques to find numerical solutions for various integrals.		
Employability and Skill Development	**Global 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 .	13
II	Finite differences – Forward, Backward differences – Interpolation formulae – Newton-Gregory forward interpolation - Newton backward interpolation - Lagrange's interpolation- Numerical Differentiation.	13
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.	13
IV	Mean, Median, Mode, Standard Deviation – Correlation & Regression – Properties	13
V	Discrete & continuous distributions: Binomial, Poisson, Normal distributions – Mean, Variance, Recurrence relation, Additive property, Moment generating function of these distributions – Properties of normal distribution.	13
Reference	**Text Books:** 1. **M.K.Venkataraman,**Numerical Methods in Science and Engineering, Fifth Edition ,The National Publishing company, Chennai, 2007. (Unit I, II and III) 2. **S.C.Gupta,**Fundamentals of Statistics, Himalaya Publishing House,2009. (Unit IV and V) (Problems only) **Reference Books:** 1. **S. C. Gupta and V.K. Kapoor**, Fundamentals of Statistics ,Himalayan Publishing House, 2000.	

	2. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI,2012 .
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: apply various methods to solve various integrals

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	2	2	3	1	3	3	2	2	1	2	3	1
CO2	3	2	2	2	2	3	2	1	2	3	3	2
CO3	2	3	2	3	2	1	1	3	3	2	1	3
CO4	2	3	3	1	3	3	2	3	2	3	3	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19A103A AC I- Statistical Methods			
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** • learn about the concepts of basic statistical methods for analyzing the samples 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.	13
II	Skewness, Moments and Kurtosis.	13
III	Correlation and Regression Analysis: Types of correlation-Karl Pearson's coefficient of correlation, Rank Correlation coefficient-Regression lines-equations.	13
IV	Definition of probability - Axiomatic approach to probability - Addition and Multiplication Theorems - Conditional Probability - Independent Events –Baye'stheorem.	13
V	Random Variables- distribution and density functions- Binomial, Poisson and Normal distributions: Definitions, Moments and Simple problems.	13
Reference	**Text Book:** **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

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	3	1	2	2	3	2	2	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	1	3	2	3	2	1	3	2	2	3	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19A104A AC II- Operations Research for Computer Applications			
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** • 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.	10
II	Simplex method for <, =, > constraints – Simplex method – Big M method.	10
III	Transportation problem Algorithm – degeneracy algorithm – Degeneracy in TP – Unbalanced TP – Assignment Algorithm – Unbalanced Assignment problem.	11
IV	Sequencing problem - Processing of n jobs through two machines – Processing of n job through three machines – Processing of two jobs through m machines.	11
V	Network – Fulkerson's rule – Measure of activity – PERT computations – CPM computation.	10
Reference	**Text Book:** **KantiSwarup, P.K. Gupta, Manmohan,** Operations Research, Sultan Chand &Company Ltd., Eleventh 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.					

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	3	2	3	1	2	2	3	2	2	3
CO2	3	3	2	3	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	2	3	2	3	2	1	3	2	2	3	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19A207A Algebra and Calculus		
I BCA	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 differentiation, integration, differential equation, Laplace transformation and matrices.		
Employability and Skill Development	Global Need	Participative Learning, Problem solving	

UNIT	Content	No. of Hours
I	Types of matrices – Characteristic Equation – Eigen values – Eigen vectors – CayleyHamilton's theorem (without proof).	13
II	Successive differential – Leibnitz's theorem and its application.	13
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.	13
IV	To solve the second order differential equations when the RHS is of the type $e^{kx}, \sin kx, \cos kx,$ $x^k, e^{ax}X$.	13
V	Definition of Laplace transform – Laplace transforms of e^{at}, $\cos at, \cos hat$, t^n, first shifting theorem – e^{-at} f(t), f(t),f'(t) – Inverse transforms relating to the above standard forms.	13
Reference	**Text Books:** **A.AbdulRasheed**,Allied Mathematics, MC.GrawHill education Pvt. Ltd.,2006. **Unit I :** Ch 3 : § (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 :** Ch12: § (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}, $\sin kx,\cos kx,x^k,e^{ax}X$.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	2	2	3	1	2	2	3	2	2	3
CO2	2	2	3	2	1	2	2	3	2	3	2	3
CO3	2	1	3	2	2	2	3	2	2	2	2	2
CO4	3	3	2	3	2	1	3	2	2	3	2	3

Strongly Correlating(S)   -   3 marks
Moderately Correlating (M)   -   2 marks
Weakly Correlating (W)   -   1 mark
No Correlation (N)   -   0 mark

Course Code & Title	19B411A Operations Research		
II BBA	**Semester : IV**	**Credits : 2**	**Hrs/ Wk : 3**
Cognitive Level	**K – 1 –** Acquire **K – 2 –** Understanding **K – 3 –** Apply **K – 4 –** Evaluate **K – 5 –** Analyze		
Course Objectives	**The course aims to** • understand LPP, graphical methods and simplex methods applied in business. • learn transportation problems, network analysis, Queuing theory, game theory and decision theory.		
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.	8
II	**Transportation problems** Introduction – Basic feasible solution – Formulation – Solving transportation problems – North West corner rule – Vogel's approximation –least cost method – Assignment problems.	8
III	**Network analysis** Introduction – Numbering of event – time estimates in network analysis – Critical path method – PERT method.	7
IV	**Queuing theory & Game theory** Definition – benefits of Queuing theory – Single channel Queuing model – Queuing cost behaviour – Game theory:Meaning and characterization – Saddle point.	8
V	**Decision theory** Definition – Structure of decision making problem - Types of decision making criteria – Baye's theorem and its application – Decision tree analysis.	8
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	

	Pvt.Ltd., 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.

Mapping of Cos with PSOs &Pos:

CO/PO	PO						PSO					
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
CO1	3	2	1	1	3	3	2	2	1	2	3	1
CO2	3	2	2	1	2	3	2	1	1	3	3	2
CO3	2	3	2	3	2	1	1	3	3	2	1	3
CO4	2	3	2	1	1	3	3	3	2	3	3	3

Strongly Correlating(S)　　　-　　　3 marks
Moderately Correlating (M)　-　　　2 marks
Weakly Correlating (W)　　　-　　　1 mark
No Correlation (N)　　　　　-　　　0 mark