SAKTHI COLLEGE OF ARTS AND SCIENCE FOR WOMEN, ODDANCHATRAM

(Recognized Under Section 2(f) and 12(B) of UGC Act 1956)

(Affiliated to Mother Teresa Women's University, Kodaikanal)

PG & RESEARCH DEPARTMENT OF MATHEMATICS

CURRICULUM FRAMEWORK AND SYLLABUS FOR OUTCOME BASED EDUCATION IN

SYLLABUS FOR

B.Sc., MATHEMATICS

FRAMED BY

MOTHER TERESA WOMEN'S UNIVERSITY,

KODAIKANAL

UNDER

CHOICE BASED CREDIT SYSTEM

2018-2021

Preamble:

Mathematical Modelling plays a very important role in the entire process as it helps to analyse various variables and parameters of the system/subsystem under consideration, both in quantitative and qualitative terms. Recent developments in mathematical science and computers have led to improved modelling and understanding of situations in all areas of human activity including not only engineering, medicine, biology, ecology, geology, oceanography but in economics and a variety of other social sciences. The Department of Mathematics has been launched in Sakthi College of Arts and Science in the academic year 2009, with the introduction of B.Sc., (Mathematics) Degree Programme. It has met with the vertical growth by the introduction of M.Sc., (Mathematics) in 2010 and M.Phil., (Mathematics) in 2014.

The Department has highly qualified faculty members and support staff and is committed towards the development of innovative and handy ways of teaching at graduate, post graduate and research level and carrying out cutting edge research in various research fields. The department strives to nurture the young minds towards embracing various scientific challenges. Project work and problem sessions are encouraged to develop innovative and analytical approach to physics learning.

Fixing the Learning Objectives:

Since the Academic year 2018 – 2019, the learning objectives and outcomes of the programmes B.Sc., (Mathematics), M.Sc., (Mathematics) and M.Phil., (Mathematics) have been set, following the Bloom's Taxonomy Cognitive Domain. Accordingly, it is broken into six levels of learning objectives of each course. They are -

K1 / Knowledge = Remember

K2 / Comprehension = Understand

K3 / Application = Apply

K4 / Analysis = Analyze

K5 / Evaluation = Evaluate

K6 / Synthesis = Create

Mapping COs with POs:

For each programme, the Educational objectives and the Specific objectives are specified. The programme outcomes are designed according to the curriculum, teaching, learning and evaluation process. For each course, the definite outcomes are set, giving challenge to the

cognitive domain. The course outcomes are mapped with the programme outcomes. The performance of the stakeholders is assessed and the attainment rate is fixed, by using the measurements 'high', 'medium' and 'low'. The restructuring of the curriculum is done based on the rate of attainment.

Institutional Objectives:

The institution has certain definite Institutional Objectives to be attained.

- Skill Development & Capacity Building
- Women Empowerment
- Self-reliance
- Gender Equity & Integrity

Programme Educational Objectives:

The Programmes B.Sc., M.Sc., and M.Phil., (Mathematics) are offered with certain Specific Objectives.

- To identify the fundamental statements for the study of various areas of mathematics and define and describe them with clarity.
- To equip graduates with life – long learning skills, will allow them to successfully adapt to the evolving technologies throughout their professional careers.
- To graduates develop teaching skills, subject knowledge in the course of their study which will help them to shine in various fields.
- To discuss, formulate and analyze problems in Mathematics and identify the concepts and principles to solve them.
- To develop need based mathematics teaching learning resources.

Mapping PEOs with IOs:

Programme Educational Objectives	**Institutional Objectives**			
B.Sc. / M.Sc. / M.Phil., (Mathematics)	**1**	**2**	**3**	**4**
PEO1: To identify the fundamental statements for the study of various areas of mathematics and define and describe them with clarity.	*			
PEO2: To equip graduates with life – long learning skills, will allow them to successfully adapt to the evolving technologies throughout their professional careers.		*		
PEO3: Graduates develop teaching skills, subject knowledge in				

the course of their study which will help them to shine in various fields.			*	
PEO4: To discuss, formulate and analyze problems in Mathematics and identify the concepts and principles to solve them.				*
PEO5: To develop need based mathematics teaching learning resources.			*	

- **Measuring: H – High; M – Medium; L – Low**

B.Sc., MATHEMATICS

Programme Outcomes: (POs)

On completion of the B.Sc., (Mathematics) Programme, certain outcomes are expected from the learners.

PO1: Gaining a broad knowledge of the mathematical concepts

PO2: Comprehending the fundamental statements for the study of various areas of mathematics and define and describe them with clarity.

PO3: Demonstrating basic manipulate skills in algebra, geometry, Trigonometry, and beginning calculus

PO4: Discussing, formulating and analyzing the problems and identifying the concepts and principles to solve them.

PO5: Evaluating the basic foundation of the underlying theorems and proofs of Mathematics.

PO6: Developing experience investigating the real world problems and learn to how to apply mathematical ideas and models to those problems.

PO7: Analyzing the varies types of problems to solving creatively and critically

ASSESSMENT PATTERN

CIA / QUESTION PATTERN & SCHEME

S.No	Section	Question Type	Marks Allotted
1	Part - A	Six questions in multiple choice pattern, testing K1 and K2 are to be given. Each question carries one mark.	03X01 = 03
2	Part - B	Two descriptive questions, with alternate options, testing K3 and K4, are to be given. Each question carries four marks.	02X02 = 04
3	Part - C	Two descriptive questions, testing K5 and K6, are to be given. Three questions are to be answered. Each question carries 15 marks.	02X04 = 08
4		Assignment	05
5		Seminar	05
		Total Marks in CIA	25

CE / QUESTION PATTERN & SCHEME

S.No	Section	Question Type	Marks Allotted
1	Part - A	Ten questions in multiple choice pattern, testing K1 and K2 are to be given. From each unit, two questions must be taken. Each question carries one mark.	10X1 = 10
2	Part - B	Five descriptive questions, with alternate options, testing K3 and K4, are to be given. Each question carries four marks. Questions are taken in the given order. Qtn. No. 11 (a) or (b) from Unit I Qtn. No.12 (a) or (b) from Unit II Qtn. No.13 (a) or (b) from Unit III Qtn. No.14 (a) or (b) from Unit IV Qtn. No.15 (a) or (b) from Unit V	5X4 = 20
3	Part - C	Six descriptive questions, testing K5 and K6, are to be given. Three questions are to be answered. Each question carries 15 marks. Questions are taken in the given order. Qtn. No. 16 from Unit I Qtn. No. 17 from Unit II Qtn. No. 18 from Unit III Qtn. No. 19 from Unit IV Qtn. No. 20 from Unit V	3X15 = 45
		Total Marks in CE	75

COMMON ACADEMIC STRUCTURE / B.Sc., MATHEMATICS / 2018 – 2021

Sem	Sub. Code	Title of the Course	Hrs	Credits	Marks		
					CIA	CE	Total
I	ULTA11	Part I Tamil	6	3	**25**	**75**	**100**
	ULEN11	Part II English	6	3	25	75	100
	UMTT11	Part III / Core I / Calculus	5	4	25	75	100
	UMTT12	Part III / Core II / Classical Algebra	5	4	25	75	100
	UAPH11	Part III / Ancillary Physics – I	5	4	25	75	100
	UVAE11	Part IV / Value education	3	3	25	75	100
		Total	**30**	**21**			**600**
II	ULTA22	Part I Tamil	6	3	25	75	100
	ULEN22	Part II English	6	3	25	75	100
	UMTT21	Part III / Core III / Analytical Geometry 3D	6	4	25	75	100
	UMTT22	Part III / Core IV / Differential Equations and Laplace Transforms	5	4	25	75	100
	UAPH22	Part III / Ancillary Physics / I Lab	5	4	25	75	100
	UEVS21	Part IV / Environmental Studies	2	2	25	75	100
		Total	**30**	**20**			**600**
III	ULTA33	Part I Tamil	6	3	25	75	100
	ULEN33	Part II English	6	3	25	75	100
	UMTT31	Part III / Core V / Statics	5	4	25	75	100
	UMTA32	Part III /Allied / Ancillary Mathematical Statistics – I	5	4	25	75	100
	UMTE31	Part III / Elective Paper I / Vector Calculus, Fourier Series and Fourier Transform	4	3	25	75	100
	UMTN31	Part IV / ONME I / Resource Management Techniques	2	2	25	75	100
	UMTS31	Part IV / SBE / Astronomy – I	2	2	25	75	100
		Total	**30**	**21**			**700**
IV	ULTA44	Part I Tamil	6	3	25	75	100

	ULEN44	Part II English	6	3	25	75	100
	UMTT41	Part III / Core VI / Dynamics	4	4	25	75	100
	UMTT42	Part III / Core VII / Sequence and Series	4	4	25	75	100
	UMTA42	Part III / Allied / Ancillary Mathematical Statistics – II	3	4	25	75	100
	UMTE42	Part III / Elective Paper II / Discrete Mathematics	3	3	25	75	100
	UMTS42	Part IV/ Skill-based Elective / Astronomy - II	2	2	25	75	100
	UMTN42	Part IV / ONME II / Mathematical Aptitude	2	2	25	75	100
		Total	**30**	**25**			**800**
V	UMTT51	Part III / Core VIII / Abstract Algebra	5	4	25	75	100
	UMTT52	Part III / Core IX / Real Analysis	5	4	25	75	100
	UMTT53	Part III / Core X / Operations Research – I	5	4	25	75	100
	UMTT54	Part III / Core XI /Number Theory	5	4	25	75	100
	UMTT55	Part III - Core XII / Numerical Methods	5	4	25	75	100
	UMTE53	Part III / Elective III / Programming in C	**3**	3	25	75	100
	UMTS53	Part IV / SBE III /Mathematical Methods	**2**	2	25	75	100
		Total	**30**	**25**			**700**
VI	UMTT61	Part III / Core XIII /Linear Algebra	5	4	25	75	100
	UMTT62	Part III / Core XIV Complex Analysis	5	4	25	75	100
	UMTT63	Part III / Core XV / Operations Research-II	5	4	25	75	100
	UMTT64	Part III / Core XVI / Graph Theory	5	4	25	75	100
	UMTT65	Part III / Core XVII / Fuzzy Sets and Fuzzy Numbers	5	4	25	75	100
	UMTE64	Part III / Elective-IV / Programming in C++	3	3	25	75	100
	UMTS64	Part IV / SBE IV / Numerical Methods Lab Using C++	2	2	25	75	100
	UEAS61	Extension Activity	2	3	25	75	100
		Total	**30**	**28**			**800**
		Grand Total		**140**			**4200**

Programme: B.Sc., **Subject:** Mathematics

Semester: I **Course:** Calculus

Course Type: Part – III/ Core Paper – I **Credits:** 4

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Learning the different concepts of differential and integral calculus	Knowledge (Level 1)
Understanding the basic knowledge of integration	Comprehension (Level 2)
Solving the multiple integrals and its Applications	Evaluate (Level 5)
Applying the concept of Change of variables	Apply (Level 3)
Solving problems encountered in everyday life, further study in science.	Evaluate (Level 5)

COURSE CONTENT

Unit I: Successive differentiation- Expansion of function - Leibnitz Theorem and its application Maxima and Minima of Function of two variables.

Unit II: Curvature – Radius of Curvature and Center of Curvature in Cartesian Form and Polar Form p - r equation; Pedal Equation of a Curve – Chord of a Curvature.

Unit III: Double Integral : Definition – Evaluation of double integral – Double integral in polar Co- ordinates.

Unit IV: Triple Integral:Definition – Applications of multiple integrals -Change of variables in the case two variables - Change of variables in the case three variables.

Unit V: Beta and Gamma functions : Definitions – Covergence of $\Gamma(n)$ – Recurrence formula of Gamma functions – Properties of Beta functions – Relation between Beta and Gamma functions – Applications of Gamma functions to multiple Integrals.

Book for Study :

- S.Narayanan and T.K.Manickachagam Pillai **–** "Calculus-Volume I & II"- Viswanathan Printers and Publishers - 2011.

  Unit I – Calculus – Volume I : Chapter 3 and Chapter 8-Sec 4,

  Unit II - Calculus – Volume I : Chapter 10.2.1 to 3.1

Unit III - Calculus – Volume I : Chapter 5- Sec. 1 to 3.2

Unit IV – Calculus - Volume II : Chapter 5- Sec. 4 to 5.4 and Chapter 6

Unit V - Calculus - Volume II : Chapter 7 – Sec. 2.1 to 6

Books for Reference:

- P.Kandasamy and K.Thilagavathi - "Mathematics for Branch I: Vol I and Vol II" - S.Chand and Company Ltd., - New Delhi - 2004.
- Arumugam Issac – " Calculus " – New Gamma Publishing House – Jan 2011.

Programme: B.Sc., **Subject:** Mathematics

Semester: I **Course: Classical Algebra**

Course Type: Part – III/ Core Paper – II **Credits:** 4

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Understanding the varies applications of algebraic Methods.	Comprehension (Level 2)
Understanding relation between roots and coefficients of equations, sign changes, reciprocals.	Comprehension (Level 2)
Creating skills for solving equations.	Creation (Level 6)
Studying in the various applications of algebraic methods	Knowledge (Level 1)
Analyzing terms of series, summation and its changes.	Analysis (Level 4)

COURSE CONTENT

Unit I : Binomial theorem – Greatest term in the expansion of $(1 + x)^n$.- sum of the coefficients - Multinomial theorem - Binomial theorem for rational index – Particular cases –Summation of binomial series - Approximate values.

Unit II: Exponential limit – Exponential theorem – Summation – Logarithmic series – Modification – Euler's constant – Logarithms of Complex Numbers.

Unit III: Summation of series – Application of partial fraction- Summation by difference series –Recuring series – Gernerating function.

Unit IV: Theory of Equations: Remainder Theorem – Relation between roots and coefficients of equations Symmetric Function of Roots – Newton's Theorem on the sum of the powers of the roots. Transformations of Equations: Roots with signs changes - Reciprocal roots.

Unit V: Reciprocal Equation - Solutionsof Numerical Equations: Solutions of Numerical Equations – Newton's methods of divisors – Horner's method.

Books for Study:

- T.K.Manickachagam Pillai and others, - "Algebra Volume I", - S. Viswanathan Printers & Publisher Pvt, Ltd., - 2010.

Unit – I - Algebra Volume I – Chapter 3

Unit – II - Algebra Volume I – Chapter 4

Unit – III - Algebra Volume I – Chapter 5

Unit – IV - Algebra Volume I – Chapter 6 – Section 1 to 15.2

Unit – V - Algebra Volume I – Chapter 6 – Section 15.3 to 30

Books for Reference :

- P. Kandasamy and K.Thilagavathy, - " Mathematics, Volume I - S.Chand and Company Ltd., New Delhi - 2004.

Programme: B.Sc., **Subject:** Mathematics

Semester: II **Course: Analytical Geometry 3D**

Course Type: Part – III/ Core Paper – III **Credits:** 4

Hours Required: 6 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Knowing of planes and its properties as a 3 dimensional objects.	Knowledge (Level 1)
Understanding the concept of skew lines and spheres	Comprehension (Level 2)
Solving problems of three dimensions	Evaluation (Level 5)
Solving the Problems related to geometry of three dimension	Evaluation (Level 5)
Applying the Geometric objects of three dimension	Application (Level 4)

COURSE CONTENT

Unit I: Rectangular cartesian coordinates :Dirction cosines of the line –Angle between the lines – Projections – Direction cosines.

Unit II: The Plane – General equation – Angle between planes – Eqation of plane through the intersection of two given planes –Length of the perpendicular.

Unit III: Straight line – Symmetric form – Equation of Plane and straight line – Shortest distance between two given lines. (CIS)

Unit IV: Sphere – General equation – Length of the tangent – Plane section of a sphere – Equation of circle on sphere – Intersection of two spheres – Equation of the tangent plane to the sphere.

Unit V: Equation of a Cone with its vertex at the origin - equation of a quadratic cone with given vertex and given guiding curve - necessary condition for general equation of second degree to represent a cone - circular cone - equation of circular cone with given vertex - axis and semi vertical angle – Cylender – Equation – Enveloping cylinder.

Text Book:

- T.K.Manickavachagom Pillay and T.Natarajan, "A Text Book of Analytical Geometry – part II - Three dimensions", Viswanathan Printers and Publishers — 2011.

  Unit I - Chapter 1

Unit II - Chapter 2

Unit III - Chapter 3

Unit IV - Chapter 4

Unit V - Chapter 5 – Sec. 1 to 8

Reference Books:

- H.K.Dasse, H.C.Saxena and M.D.Raisinghania, "Simplified Course in Solid Geometry(3D)" – S.Chand and Company.
- P.Duraipandian, "Analytical Geomentry – 3 Dimensional "- Emerald publishers – 1998

Programme: B.Sc., **Subject:** Mathematics

Semester: II **Course:** Differential Equations and Laplace Transforms

Course Type: Part – III/ Core Paper – IV **Credits:** 4

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Introducing the basic concept of differential equations	Knowledge (Level 1)
Analyzing theory of partial differential equations	Analysis (Level 4)
Solving varies types of differential equations	Evaluation (Level 5)
Solving Partial Differential Equations using various techniques	Evaluation (Level 5)
Determining solutions to second order linear homogeneous equations	Evaluation (Level 5)

COURSE CONTENT

Unit I: Differential Equations of the first order and first degree : Variable separable Homogeneous, non – homogeneous, Linear equation, Bernoulli's equations, Exact differential equations. Equation of the first order and higher degree : Equations Solvable for dy/dx – equations solvable for y – equations solvable for x – Clairaut's form.

Unit II: Linear equations with constant Co – efficient : Definition – complementary function of a Linear equation with constant Co – efficient – particular Integral – General method of finding P.I – special methods for finding P.I of the functions of the type e^{ax} , cos ax or sin ax , e^{ax} V where V is any function of x , x^m – Linear equations with Variable Co – efficient, Equations reducible to the linear equations.

Unit III: Simultaneous Differential equations : Simultaneous equations of the first order and first degree – Simultaneous linear differential equations: Linear equations of the second order : Complete solution given a known integral – Reduction to the normal form – Change of Independent Variables – Variation of Parameters – Methods of operations factors.

Unit IV : Formation of PDE – Lagrange method of solving linear PDE – Solution of PDE of type F(p,q)=0, F(z,p,q)=0, F(x,p) = G(y,q), Clairaut's form and Charpit's method.

Unit V: Laplace Transforms : Definition, laplace transform of periodic functions – Some general theorems – The inverse Transform's.

Books for Study:

- S. Narayanan and T.K. Manickavachagam Pillai," Differential equations and its applications" S. Viswanathan Printers and Publishers Pvt. Ltd., Madras 2014.

  Unit I - Chapter 2 and 4.

  Unit II- Chapter 5 – Sec. 1 to 6.

  Unit III- Chapter 6 and 8.

  Unit IV –Chapter 12 Sec. 1 to 5.4 and 6.

  Unit V- Chapter 9 – Sec. 1to 7.

Books for Reference :

- Arumugam and Isaac - Differential equations and applications, - New gamma publishing house – 1999.
- P.Kandasamy and K. Thilagavathi "Mathematics for Branch I: Volume III" S. Chand And Company Ltd.,New Delhi – 2004.

Programme: B.Sc., **Subject:** Mathematics

Semester: III **Course: Statics**

Course Type: Part – III/ Core Paper – V **Credits:** 4

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Gaining knowledge about the nature of forces	Knowledge (Level 1)
Differentiating between static and dynamic forces	Evaluation (Level 5)
Applying geometric properties in equilibrium	Application (Level 3)
Understanding the Real Time Applications	Comprehension (Level 2)
Applying the concept in Parallel forces, moments and compels	Application (Level 3)

COURSE CONTENT

Unit I: Forces acting at a point : Resultant and Components- Parallelogram of Forces- Analytical expression for the Resultant of two forces acting at a point – Triangle of Forces – Perpendicular Triangle of Forces – Converse of the Triangle of Forces- The Polygon of Forces – Lami's Theorem – An extended form of the parallelogram law of Forces- Resolution of a Force – Components of a Force along two given directions –Theorem on Resolved parts.

Unit II: Resultant of any number of Coplanar Forces Acting at a Point: Analytical Method - Conditions of Equilibrium of any Number of forces Acting upon a Particle – Geometrical or Graphical Conditions - Analytical Conditions. Parallel Forces and Moments: To find the Resultant of Two like parallel forces acting on a rigid body- To find the Resultant of Two unlike and unequal parallel forces acting on a rigid body – Resultant of a Number of Parallel Forces Acting on a rigid Body – conditions of Equilibrium of Three Coplanar Parallel Forces – Centre of two Parallel Forces – Moment of a Force – Physical Significance of the Moment of a Force – Geometrical Representation of a Moment – Sign of a Moment.

Unit III: Unit of Moment – Varigon's theorem of moments – Generalised Theorem of Moments (Principle of Moments)- Moment of a Force a about an axis. Couples: Definition – Equilibrium of two couples – Equivalence of two Couples- Couples in Parallel Planes – Resultant of Coplanar Couples - Resultant of a Couple and a Force.

Unit IV: Equilibrium of Three forces Acting on a Rigid Body: Rigid Body subjected to any Three Forces – Three Coplanar Forces – Conditions of Equilibrium- Procedure to be followed in solving any Statical Problem – Two Trigonometrical Theorems – Coplanar Forces: Introduction - Reduction of any number of Coplanar forces – analytical Proof of theorem – Conditions for a system of forces to Reduce to a single force or to a Couple.

Unit V: Friction: Introduction – Experimental Results – Statical, Dynamical and Limiting Friction – Law of Friction – Friction-a Passive force – coefficients of Friction – Angle of Friction – Cone of Friction – Numerical Analysis – Equilibrium of a particular 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.

Books for Study :

- M.K.Venkatraman, 'Statics', 12th edn, Agasthiar Publications, Trichy,2010.

Unit I - Chapter 2 – Sec. 1 to 13.

Unit II - Chapter 2 – Sec 15, 16 and Chapter 3 – Sec 1 to 10.

Unit III- Chapter 3 – Sec. 11 to 14 and Chapter 4.

Unit IV – Chapter 5 and Chapter 6 – Sec. 1 to 5.

Unit V – Chapter 7.

Books for Reference :

- A.V.Dharmapadam, ''Statics', S Viswanathan Printers and Publishing Pvt.,Ltd. 1993
- P.Duraipandian and Lakshmi Duraipandian, 'Mechanics', S.Chand and Company Ltd,New Delhi - 1985.
- Dr.P.P.Gupta, 'Statics', Kedal Nath Ram Nath, Meerut,1983-1984.

Programme: B.Sc., **Subject:** Mathematics

Semester: III **Course:** Ancillary Mathematical Statistics - I

Course Type: Part – III/ Allied – II **Credits:** 4

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Gaining knowledge about the concepts of Probability	Knowledge (Level 1)
Applying statistical investigation of real life situations.	Apply (Level 3)
Solving problems arise in different situations	Evaluate (Level 5)
Developing various types of distributions.	Analyze (Level 4)
Differentiating between discrete and continuous random variables .	Evaluate (Level 5)

COURSE CONTENT

Unit I : Measures of Dispersion: Dispersion – range, quartile deviation – mean deviation – standard deviation – root mean square deviation – Relation between standard deviation and root mean square deviation – effect of change of origin and scale on moments – Karl pearson's beta and gamma co-coefficient – measures of Skewness – Kurtosis.

Unit II Theory of Probability : Definition of various terms – Law of addition of probabilities for two events – statement of general law of addition of probabilities – Bayes Theorem.

Unit III Continuous random variables : Probability density function – various measures of central tendency, dispersion, Skewness and Kurtosis for continuous probability distribution.

Unit IV Mathematical Expectation : Addition and Multiplication Theorem – covariance – Expectation and variance of a linear combination of random variables – Expectation of continuous random variable – Moment generating function and its properties – uniqueness Theorem on Characteristic function- Chebyshev's inequality – weak law and bernoulie's law of large numbers.

Unit V Theoretical Discrete Distribution :Bernoulli Distribution and its moments – Binomial Distribution – moments, mean deviation about mean, mode, M.G.F and Characteristic function –

recurrence relation for the moments – additive property of independent Poission variants – recurrence formula for the probability of the Binomial Distribution and Poission Distribution.

Books for Study :

- S.C Gupta and V.K. Kapoor , "Elements of Mathematical Statistics ",Sultan Chand Publishers, New Delhi. 2009.

  Unit I - Chapter 3.

  Unit II - Chapter 4.

  Unit III- Chapter 5.

  Unit IV- Chapter 6.

  Unit V – Chapter 7.

Books for Reference :

- P.R.Vittal, "Mathematical Statistics ", Margham Publications -2002- Reprint 2012.

Programme: B.Sc., **Subject:** Mathematics

Semester: III **Course:** Vector Calculus, Fourier Series and Fourier Transforms

Course Type: Part – III/ Elective Paper – I **Credits:** 3

Hours Required: 4 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Introducing the basic concept of vector calculus	Knowledge (Level 1)
Analyzing the fourier series and their applications	Analysis (Level 4)
Solving varies types Integrals	Evaluation (Level 5)
Understanding the concepts of vector Integration	Comprehension (Level 2)
Applying the Fourier Transforms Methods	Application (Level 3)

COURSE CONTENT

Unit I: Differentiation of Vector – Vector operator del - Grad, Div and Curl –Directional derivative - Solenoidal, Irrotational vector –formulas involving del operator – Angle between the surfaces.

Unit II: Vector Integration – Line, Surface and volume integrals – Gauss divergence, Green's and Stoke's theorems – Verification of theses theorems.

Unit III: Fourier Series: Definition- Dirchlet's conditions- Fourier Series of periodicity 2π and 2l - Odd and even functions –Root mean square value of a function - Parseval's theorem.

Unit IV: Half range series – Parseval's theorem - Harmonic analysis- Complex form of Fourier Series.

Unit V: Fourier Transform – Properties – Fourier integral theorem – convulution theorem – problems.

Books for Study :

- Arumugam and Issac , "Analytical Geomentry 3D and vector calculus, Sci. Tech Publishers – 2011.
  - Unit I – Chapter 5.

- Unit II – Chapter 6 – Sec 6.1,6.2.

- P. Kandasamy and K.Thilagavathy, " Mathematics, Vol IV, S.Chand and Company Ltd.,-2004.
  - Unit III – Chapter I .
  - Unit IV – Chapter I.
  - Unit V - Chapter IV.

Books for Reference :

- T.K.Manickavasagam pillay and Narayanan , "Vector Algebra and Analysis" Viswanathan printers and publishers Pvt Ltd.,

Programme: B.Sc., **Subject:** Mathematics

Semester: III **Course:** Resource Management Techniques

Course Type: Part – IV/ ONME **Credits:** 2

Hours Required: 2 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Developing the evaluate short, and long term process	Analysis (Level 4)
Studying for Linear Programming Problem	Knowledge (Level 1)
Solving different types of problems	Evaluation (Level 5)
Applying the concept of Sequencing Problem	Application (Level 3)
Understanding the concept of basic Game Theory	Comprehension (Level 2)

COURSE CONTENT

Unit I: Definition-Mathematical formation of the Linear Programming Problem— Basic Solution- Degenerate Solution- Basic Feasible Solution of the Linear Programming Problem.

Unit II: Transportation Problem: Definition-Mathematical form of L.P.P-Table-Find Intial Basic Feasible Solution – North West Corner Rule -Row Minima-Colum Minima- Least Cost Method-Vogel's Approximations Method(VAM) - Un balanced Transportation problem- Only upto Intial Basic Feasible Solution.

Unit III: Assignment Problem: Definition-Mathematical formulation of the problem– Hungarian Algorithm – Simple Problem .

Unit IV: Sequencing Problem: Definition-Problem of Sequencing- Basic Terms Used in Sequencing- Processing n jobs & Two machine- Processing n jobs Through two Machines.

Unit V: Game Theory: Definition- Two-Person Zero-Sum Games- Some basic terms- The Maximin-Minimax Principle- Game without Saddle point- Mixed Strategies - Graphic Solution of $2 \times n$ and $m \times 2$ games.

Books for Study :

- Kanti Swarup, P.K .Gupta,Man Mohan"Operations Research", Sultanchand and sons , Edition - 2017.

Unit I – Chapter 2 and 4.

Unit II – Chapter 10.

Unit III – Chapter 11.

Unit IV - Chapter 12.

Unit V – Chapter 17.

Books for Reference :

- P.R.Vittal and V.Malini, " Operations Research " Margham Publishers – 2002.

Programme: B.Sc., **Subject:** Mathematics

Semester: III **Course:** Astronomy I

Course Type: Part – IV/ SBE - I **Credits:** 2

Hours Required: 2 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Gaining the knowledge about natural science	Knowledge (Level 1)
Understanding the varies triangles and formulas	Comprehension (Level 2)
Describing the concept of morning and evening stars, circumpolar stars	Analysis (Level 4)
Learning the different concepts of morning and evening stars	Knowledge (Level 1)
Applying the concept of diurnal motion of sun and stars	Application (Level 3)

COURSE CONTENT

Unit I: Spherical trigonometry:Sphere - Great circles and small circles- Axis and poles of circle – distance between two points on a sphere-angle between two circles-secondaries-angular radius or spherical radius – spherical figures –spherical triangles –polar triangle –theorems - Relation between spherical triangles and its polar triangle- Some properties of Spherical triangles-principal of duality-colunar and anti podal triangles –Relation between sides and angles of a spherical triangle- Cosine formuls- cotangent formula-supplemental cosine formula.

Unit II: Functions of half an angel- functions of half a side – Delambre's analogies –Napier's analogies- right angled spherical triangle –Napier's rules- Sphereical Coordinates – relation between the Sphereical and rectangular coordinates – general proof of the cosine formula – formula in plane trigonometry –Important note.

Unit III: Astronomy-celestial sphere – Diurnal motion, celestial axis and equator –celestial Horizon – Zenith and Nadir –celestial Meridan – Cardinal points – Northern and souther hemispheres – Eastern and southern hemispheres – Eastern and western hemispheres – visible and invisible hemispheres – Declination circles –verticals – parallacte angle –Rising and setting – transit or culmination- Due east and due west – due south and due north – annual motion of the sun, ecliptic , obliquity-first point of Aries and first point of libra – equinozes and solstices –

coloures - Celestial Coordinates: Horizontal system – equatorial system- meridian system – ecliptic system – to represent the different systems of coordinates in the same figure – conversion of coordinates –relation between right ascension and longitude of the sun- to trace the changes in the coordinates of the sun in the course of a year – the longitude of the sun on any day. (with worked examples)

Unit IV: Sideral time –west hour angle of a body expressed in time units – theorem- latitude of a place – theorem- to determine – tee R.A. and Declination of a body- to find the hour angle of a body at rising or setting – to find the duration of day time –to trace the changes in the azimuth of a star in the course of a day. (with worked examples)

Unit V: Morning and evening stars –circumploar stars – to find the condition that a star is circumpolar. (with worked examples)

Books for Study :

- S.Kumaravelu and Susheela Kumaravelu, "Astronomy for degree classes, Rainbow Printers, Nagarcoil, Reprint 2000.(Copies can be had of S.Kumaravelu, Muruga Bhavanam, Chidambaranager, Nagercoil)

Unit I – Chapter I: Subsection 1- 24

Unit II – Chapter I: Subsection 25 -38

Unit III – Chapter II: Subsections: 39 – 68

Unit IV - Chapter II: Subsection 70 - 79

Unit V – Chapter II: Subsection 80 – 86

Books for Reference :

- Prophet Muhammad, "Astronomy: Supplemental Guide", Core Knowledge Foundation, 2013

Programme: B.Sc., **Subject:** Mathematics

Semester: IV **Course:** Dynamics

Course Type: Part – III/ Core Paper - VI **Credits:** 4

Hours Required: 4 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Gaining knowledge regarding projectiles	Knowledge (Level 1)
Differentiating between impact and impulse of a particle on a surface	Evaluation (Level 5)
Understanding the dynamic changes in the body under the action of forces	Comprehension (Level 2)
Studying the concepts of simple harmonic motion	Knowledge (Level 1)
Applying the concept in motion under action of central forces.	Application (Level 3)

COURSE CONTENT

Unit I: Newton Laws of Motion and Applications.

Unit II: Projectiles – Equation of path range etc. –Range of a particle projected on an inclined plan etc.

Unit III: Impulses – Impact in a fixed plane – Direct and Oblique impact.

Unit IV: Simple harmonic motion – Equation of motion – composition of two simple harmonic motions – simple pendulum.

Unit V: Central Orbits – components velocity and accelerations along and perpendicular to the radius vector – differential equations of a central orbit pedal equation.

Books for Study :

- M.K.Venkatraman, 'Dynamics', 9th edn, Agasthiar Publications, Trichy,1997.

  Unit I – Chapter 4 – Sec. 4.1 to 4.37

  Unit II – Chapter 6 – Sec. 6.1 to 6.17.

  Unit III – Chapter 8 – Sec. 8.1 to 8.10.

  Unit IV – Chapter 10 – Sec. 10.1 to 10.16.

  Unit V – Chapter 11 – Sec. 11.1 to 11.15.

Books for Reference :

- A.V.Dharmapadam,‘Dynamics’,S.Viswanathan Printers and Publisher Pvt.,Ltd.,Chennai 1993.
- K.Viswanntham Naik and M.S.Kasi, ‘Dynamics’, Emerald Publishers, 1992 .
- Narayanamurthy and N.Nagarathnam , ‘Dynamics’, National Publishers, New Delhi,1991..

Programme: B.Sc., **Subject:** Mathematics

Semester: IV **Course:** Sequence and Series

Course Type: Part – III/ Core Paper - VII **Credits:** 4

Hours Required: 4 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Understanding the various Types of Sets	Comprehension (Level 2)
Analyzing terms of series, and finding the rearrangements	Analysis (Level 4)
Developing skills in the area of sequence and series	Analysis (Level 4)
Solving the varies types of Tests	Evaluation (Level 5)
Applying the concept of Power series	Application (Level 3)

COURSE CONTENT

Unit I : Sequences: Definition – Bounded sequences – Monotonic sequences – Convergent sequences – Divergent and Oscillating sequences – Solved problems – Behaviour of monotonic sequences.

Unit II : Some theorems on Limits – subsequences – Limit points – Cauchy sequences – the upper and Lower limits of a sequence – solved problems.

Unit III : Series of Positive terms : Definition – Cauchy's general Principle of convergence – comparison test – Kummer's Test – D' Alembert's ratio test – Raabe's Test – De morgan and Bertrand's test , Gauss's test.

Unit IV : Cauchy's root test – Cauchy's Condensation test – Integral test – Series of arbitrary terms: Alternating series – Leibnitz's test – Absolute convergence – Test for Convergence of Series of Arbitrary terms – Dirichlet's test – Abel's test.

Unit V : Rearrangement of series: Definition – Riemann's theorem – multiplication of series : Definition – Abel's theorem – Merten's theorem – Power series.

Books for Study :

- Arumugam and Issac, "Sequences and series", New Gamma publishing House, December 2015. Brouch(refeold writes Algebra,)
  Unit I – Chapter 3 – 3.1 to 3.7.

Unit II – Chapter 3 – 3.8 to 3.12.

Unit III – Chapter 4 – 4.1 to 4.3.

Unit IV –Chapter 4 – 4.4 and 4.5, Chapter 5 – 5.1 to 5.3.

Unit V – Chapter 5 – 5.4 to 5.6.

Books for Reference :

- S.C.Malik ,Savita Arora.,"Mathematical Analysis**",** New Age International Private Limited.

Programme: B.Sc., **Subject:** Mathematics

Semester: IV **Course: Ancillary Mathematical Statistics - II**

Course Type: Part – III/ Allied Paper - III **Credits:** 4

Hours Required: 3 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Understanding the concept of Applied Statistics	Comprehension (Level 2)
Developing clear idea regarding correlation and regression	Evaluation (Level 5)
Gaining the knowledge in sampling Theory	Knowledge (Level 1)
Solving the varies types of Sampling Distribution	Evaluation (Level 5)
Applying the concept of Statistical Methods	Apply (Level 3)

COURSE CONTENT

Unit I: Theoretical Continuous Distributions – Rectangular Distribution – Normal Distribution as Limiting form of Binomial Distribution – Chief Characteristic of Normal Distribution and Normal Probability curve – Mode, Median, M.G.F, Moments, Mean Deviation form the Mean of Normal Distribution – A linear combinations of Independent Normal variants – Points of Inflexion of Normal Curve – Area property- Fitting of Normal distribution.

Unit II : Curve fitting – Fitting of a straight Line, Second degree Parabola Polynomial of k^{th} degree change of Origin – fitting of power curve $y=ax^b$ fitting of Exponential curves $y=ab^x$, $y=ae^{bx}$ - Theory of attributes – Notations – Dichotomy Classes and Class frequencies – order – relation between class frequencies – class symbles as operators – Condition, for consistency of data – Independence of Attributes and its criterion – association of Attributes – Yules – Co-efficient of association.

Unit III :Correlation and regression bivariate Distribution – Correlation – Scatter diagram- Karl Pearson Co-efficient for correlation and Limits – calculation of Correlation Co-efficient for a bivariate frequency Distrubution- Rank Correlation- Repeated Ranks – Regression – Line of Regression – Regression Co-efficient and Its Properties – Angles between two lines of regression.

Unit IV: Sampling and Large sample test – Introduction- Types of sampling – parameters and Statistics – Test of Significance – Null – Hypotheses – test of Significance for single mean, Differnce of Means – Difference of standard Deviation, Exact Sampling Distribution – Chi-square variate – Derivation- M.G.F.Mode, Skewness of Chisquare Distribution – additive property of Chi-square variates – Application Chi-square Distribution – Chi-square test for population Varaince and Goodness of Fit – Independence of Attributes.

Unit V: Exact Sampling distribution – t,f and z distribution, definitions and Applications to t,f and z distribution – test for single mean, differencesw of mean, Observed Correlation Co-efficient – f test for quality of population on variance .

Books for Study :

- S.C.Gupta&V.K.Kapoor ,"Elements of Mathematical Staistics", course of Madras: Madurai University, Sultan Chand Publishers, New Delhi 2009

  Unit I - Chapter 8 -8.1 to 8.2.11,8.2.14.

  Unit II -Chapter 9- 9.1 to 9.3 and chapter 11

  Unit III -Chapter 10.

  Unit IV - Chapter 12.

  Unit V -Chapter 13 and 14.

Books for Reference :

- Arumugam and Thangpandi "Probability and Statistics", New Gamma Publishing House,2006.
- P.R. Vittal, " Mathematical Statistics", Margham Publications, 2012.

Programme: B.Sc., **Subject:** Mathematics

Semester: IV **Course: Discrete Mathematics**

Course Type: Part – III/ Elective Paper - II **Credits: 3**

Hours Required: 3 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Understanding the concept of Mathematical logic such as connections	Comprehension (Level 2)
Classifying the concept of Normal Forms	Evaluation (Level 5)
Gaining the knowledge in Formal Languages and Automatta	Knowledge (Level 1)
Analyzing the free and bound variable formulas	Analysis (Level 4)
Applying the concept of Mathematical logic as Tautology	Application (Level 3)

COURSE CONTENT

Unit I: Mathematical Logic Statement and Notation – Connection – Negation Conjunction – Disjunction – Statement Formulas and Truth Tables – Logical Capabilities of Programming Languages – Conditional and Bi Conditional – Well Formed Formula – Tautologies – Equivalence of Formula – Duality Law Tautological Implication.

Unit II: Normal Forms: Disjunctive Normal Forms – Conjunctive Normal Forms – Principal Disjunctive Normal Forms – Principal Conjunctive Norms.

Unit III: Theory of Inference – Truth Table Technique – Rules of Inference - Inconsistent Premises – Indirect Method of Proof – Predicate calculus- Free and Bound Variables – Valid Formulas and Equivalences – Inference Theory of Predicate Calculus.

Unit IV: Grammar : Definition – Types of Grammar – Phrase Structure Grammar – Context Sensitive Grammar – Context Free Grammar – Regular Grammar – Languages Generated by these Grammars.

Unit V: Automata -Definition – Deterministic Automation – Non-Deterministic Automates – Conversion of NDFSA to DFSA- Pushdown automata.

Books for Study :

- J.P.Tremblay, R. Manohar – "Discrete Mathematical Structures with Applications to

Computer Science", Tata McGraw – Hill Edition 1997. (Ref) Murukesan from Kovai

Unit I- Chapter :1- 1-1,1-2:1-2.1 to 1-2.11.

Unit II-Chapter :1-3.1 to 1-3.4

Unit III- Chapter: 1-4.1to 1- 4.3 .1-5 to1-5.4,1-6:1-6.1 -1-6.4

- Dr.Rani Siromoney, Formal Languages and Automata, The Chiristian Literature Society, Revised Edition 1979.

  Unit IV-Chapter2 : 2.1 to 2.6

  Unit V-Chapter 5: 5.1 and Chapter 6

Books for Reference :

- B.S.Vatssa, "Discrete Mathematics",WISHWA PRAKASHAN,1993.
- V.Sundaresan,K.S.Ganapathy Subramanian, K.Ganesan, "Discrete Mathematics", A.Rd.Publications, 1998.
- T.Veerarajan, "Discrete Mathematics", McGraw Hill Education (India)Pvt.Ltd,New Delhi, 2014.

Programme: B.Sc., **Subject:** Mathematics

Semester: IV **Course: Mathematical Aptitude**

Course Type: Part – IV/ ONME **Credits: 2**

Hours Required: 2 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Developing the skills in numerical and quantitative techniques	Evaluation (Level 5)
Analyzing to evaluate various real life situations	Analysis (Level 4)
Solving different types of Mathematical problems	Evaluation (Level 5)
Understanding the concepts of Quantitative Techniques	Comprehension (Level 2)
Applying the concept of Fractions	Application (Level 3)

COURSE CONTENT

Unit I : Numbers – HCF – LCM – Problems on numbers. (Chapters 1, 2 & 7)

Unit II : Decimal Fractions and Simplification. (Chapter 3 & 4)

Unit III : Surds and Indices – Percentage – Profit and Loss. (Chapters 9, 10 & 11)

Unit IV: Ratio and Proportion – Partnership – Allegation or Mixture. (Chapters 12, 13 & 20)

Unit V : Average – Problems on Age. (Chapters 6 &8)

Books for Study :

- R.S.Aggarwal, Scope and treatment as in "Quantitative Aptitude" , S.Chand & Company Ltd., Ram Nagar, New Delhi -2007.

Programme: B.Sc., **Subject:** Mathematics

Semester: IV **Course: Astronomy II**

Course Type: Part – IV/ SBE II **Credits: 2**

Hours Required: 2 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Gaining the knowledge of equation of time, seasons from earth rotation	Knowledge (Level 1)
Applying the various fields such as physics, chemistry	Application (Level 3)
Calculating to prepare Calendar and conservation of Time	Evaluation (Level 5)
Learning the concepts of earth's pole	Knowledge (Level 1)
Understanding the basic knowledge of equation of Time	Comprehension (Level 2)

COURSE CONTENT

Unit I: The zones of earth –to trace the variations in the durations of day and night during the year at different stations –to find the duration of perpetual day in a place of latitude – to find analytically the conditions for perpetual day and night –Terrestrial latitudes and longitudes – Phenomena depending on the change of latitudes and longitudes-Date line – Shape of Earth – Geographical and geocentric latitudes of a place – to find the reduction of latitude –Ellipicity – to prove that reduction of latitude is c $\sin 2\phi$- to find the geocentric distance of a station of geographical latitude ϕ - to find the radius of curvature of the earth at a station of geographical latitude ϕ - Geographical and Nautical mile.

Unit II: Radius of earth – Another method to determine the radius of earth -arguments in favour of earth's rotation- experimental proofs for the rotation of earthDip of Horizon –to find a expression for Dip.

Unit III: To find the distance between two mountains whose tops are just visible from each other – Effects of Dip- to find the acceleration in the time of rising of a star due to dip-Twilight –tofind the duration of twilight- to find the condition that twilight may last throughout night –to find the

number of consecutive nights having twilight throughout night – to find the duration of twilight when it is shortest- civil, nautical and astronomical twilights.

Unit IV: Equation of time: Introduction- Dynamical mean sun- equation of time – analytical expression for the equation of time –effect of equation of time on the lengths of morning and evening-to prove that the equation of time vanishes four times a year –seasons –causes of seasons.

Unit V: Calendar:Different kinds of year –civil year, Julian calendar – Gregorian calendar – Julian date –Besselian year -Conversion of Time: Relation between sidereal and mean times –to convert mean solar time into sidereal time - to convert sidereal time into mean solar time – to find the sidereal time at a given instant of mean solar time on a given date at Greenwich – to find the mean time corresponding to a given instant of sidereal time at Greenwich – the difference between local times – to find the sidereal time from local mean time for a given place- to find the mean time from the sidereal time for a given place- given the right ascensions of a star and the mean sun, to find the mean time of transit of the star.

Books for Study :

- S.Kumaravelu and Susheela Kumaravelu , Astronomy for degree classes, Rainbow Printers, Nagarcoil,2005.

  Unit I : Chapter III: Subsection 87 -101

  Unit II : Chapter III: Subsection 102 -107.

  Unit III : Chapter III: Subsection 108-116

  Unit IV : Chapter VII: Subsection 166- 170 and 172-174

  Unit V : Chapter VII: Subsection 175- 184 and 186- 189.

Books for Reference :

- Prophet Muhammad, “Astronomy: Supplemental Guide”, Core Knowledge Foundation,2013

Programme: B.Sc., **Subject:** Mathematics

Semester: V **Course: Abstract Algebra**

Course Type: Part – III/ Core Paper VIII **Credits: 4**

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Understanding the concept of Ideal Quotient Rings and Fields	Comprehension (Level 2)
Developing aspects of Subgroups, Normal Subgroups and Quotient Groups	Evaluation (Level 5)
Gaining the knowledge in Ring Theory	Knowledge (Level 1)
Providing some knowledge about various algebraic structures	Knowledge (Level 1)
Recognizing basic properties of groups and subgroups	Analysis (Level 4)

COURSE CONTENT

Unit I: Groups – Definition and Examples – Elementary Properties of a Group Quaternion group Groups of symmetries - Order of an Element.

Unit II: Subgroups – Homomorphism- Cayley's Theorem - Group of Permutation - Cyclic Groups- Automorphism .

Unit III: Cosets and Lagranges Theorem – Normal Subgroups and Quotient Groups-Fundamental theorem of homomorphism.

Unit IV: Rings-Definitions and Examples - Elementary properties of rings – division rings and fields Ordered integral domain –subring and sub field-prime fields.

Unit V: Homomorphism of rings and their types- Ideals – Quotient structure and Isomorphism theorems- Maximal and Prime Ideals-Field of quotient of an integral domain.

Books for Study :

T.K.Manickavasagampillai and Narayanan , "Modern Algebra"volume I & II Viswanathan printers and publishers Pvt Ltd., Edition 1982.

Unit I- Chapter 6 – 6.1 to 6.2

Unit II- Chapter 6 – 6.3 to 6.7

Unit III- Chapter 6 – 6.8 to 6.10

Unit IV- Chapter 7 – 7.1 to 7.4

Unit V- Chapter 7 – 7.5 to 7.9

Books for Reference :

Arumugam S and Thangapandi Issac ," Modern Algebra", SCITECH Publications, Chennai, Edition 2003.

A.R.Vasishtha, "Modern Algebra", Krishna Prakashan Mandir, Meerut, 1994 – 95.

Programme: B.Sc., **Subject:** Mathematics

Semester: V **Course: Real Analysis**

Course Type: Part – III/ Core Paper IX **Credits: 4**

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Understanding the concept of Sets and Metric Spaces	Comprehension (Level 2)
Applying the theorems of connectedness and Compactness	Application (Level 3)
Learning the knowledge in Set Theory, Countable and Uncountable Sets	Knowledge (Level 1)
Recognizing basic properties of Metric Spaces	Analysis (Level 4)
Understanding the basic concepts of continuous Functions	Comprehension (Level 2)

COURSE CONTENT

Unit I:. Countable and Uncountable sets- Inequalities of Holder and Minkowski- Metric spaces- Definition and Examples-Bounded set in a metric spaces- Open balls in a metric spaces- open sets-subspaces- Interier of a set.

Unit II: Closed sets – Closure- Limit point- Dense sets- Complete metric space- Introduction- Completeness-Baire's Category theorem.

Unit III: Continuity: Introduction- Continuity-Homeomorphism-Uniform continuity –Dis continuous function on R.

Unit IV: Connetedness: Introduction- Definition and Examples –Connected subset of R – connectedness and continuity.

Unit V: Compactness: Introduction- compact space –compact subsetsof R-equivalent characterisation for compactness –Compactness and continuity**.**

Books for Study :

- Arumugam S and Thangapandi Issac **,"** Modern Analysis", New gamma Publishing house , Edition 2013.

  Unit I – Chapter 1& 2 – 1.2 to 2.6) Unit II – Chapter 2 & 3 – 2.7 to 3.2)

  Unit III – Chapter 4 – 4.1 to 4.4) Unit IV –Chapter 5

  Unit V – Chapter 6

Books for Reference :

- Walter Rudin, “Principles of Mathematical Analysis”, McGraw-Hill International. Editions (3^{rd}) – 1976.
- V.Karunakaran, “Real Analysis”, Pearson Publications,Edition-2012.
- Appostol, “Mathematical Analysis”, Narosa Publishing House-Second Edition-2002.

Programme: B.Sc., **Subject:** Mathematics

Semester: V **Course: Operations Research - I**

Course Type: Part – III/ Core Paper X **Credits: 4**

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Developing the concept of short, long term processes and solve Problems	Analysis (Level 4)
Identifying the basic analysis of various inventory Models	Evaluation (Level 5)
Studying the concept of duality in an Linear Programming Problem	Knowledge (Level 1)
Understanding the concept of duality programming	Comprehension (Level 2)
Analyzing the different aspects of Transportation Problem and also Assignment Problem	Analysis (Level 4)

COURSE CONTENT

Unit I: Linear Programming : Mathematical formulation of linear programming problem- Graphical solution- Simplex method - Use of Artificial Variables: – Big M Method – Two Phase Method .

Unit II: Degeneracy in Linear Programming – Duality - Duality Theorem – Duality and Simplex Method – Dual Simplex Method .

Unit III: Transportation Problem**:** Mathematical formulation of the problem - Finding Initial Basic Feasible Solution using North - West Corner Rule - Matrix Minima Method - Vogel's Approximation Method - Optimum solution – MODI method .

Unit IV: Assignment Problem: Mathematical formulation of Assignment Problem- Assignment Algorithm-Minimazation case Routing problem.

Unit V: Inventory Control: Types of Inventories – The inventory decisions economic order quantity – Deterministic Inventory Problems: EOQ Problem with no shortages – EOQ Problem with price break – EOQ Problem with two price break – EOQ Problem with n price break.

Books for Study :

- Kantiswarup, P.K.Gupta, Manmohan"Operations Research", Sultanchand and sons , Edition 2000.

Unit I- Chapter 2,3,and 4 - 4.1 to 4.5

Unit II- Chapter 5 -5.1 to 5.7

Unit III- Chapter 10

Unit IV- Chapter 11

UnitV- Chapter 19 – 19.1 to 19.10,19.12

Books for Reference :

- J.K.Sharma, “Operations Research”,Macmillan India Ltd. 1997.
- Prem Kumar Gupta, D.S. Hijra, “Operations Research”,S. Chand & Company Ltd,2002.
- P.R.Vittal, “Operations Research,Margham Publicatioons, 2002.

Programme: B.Sc., **Subject:** Mathematics

Semester: V **Course: Number Theory**

Course Type: Part – III/ Core Paper XI **Credits: 4**

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Differentiating Various Types of Functions	Knowledge (Level 1)
Applying the theorems of Numbers	Apply (Level 3)
Developing basic concept of Number Theory	Application (Level 3)
Analyzing the concept of numbers and its Properties	Analyze (Level 4)
Understanding the basic concepts of Number Theory	Comprehension (Level 2)

COURSE CONTENT

Unit I: Well – Ordering Principle(WOP)- Principle of Finite Induction- The Division Algorithm – Basis Representation Theorem- Binomial Coefficients- Divisibility Theory : Greatest Common Divisor-Least common Multiple- Linear Diophantine Equations- Fundamental Theorem of Arithmetic - Some Question Regarding Primes.

Unit II: Congruences: Definition – Residue System – Test of Divisibility – Linear congruences - Solving Polynomial congruences – An Application of Congruences to Diophatine Equations - Fermat's Little theorem –Euler's Generalisation of □□□$_1$.

Unit III: Wilson's Theorem- Euler's Φ-Function- Arithmetic Functions: The Function τ and σ – The Möbius Function- Multiplicative Arithemetic Functions- Inversion Formula- Greastest Integer Function.

Unit IV: Primitive roots : Exponents – Primitive roots Modulo a Prime – Determination of Integers having Primitive roots – Indices – Euler's Criterion – Legendre Symbol and its Properties – Gauss Lemma.

Unit V: Quadratic Reciprocity Law and its applications – Jaccobi Symbol – Perfect Numbers – Mersenne Primes-Fermat Numbers-Phythagorean Triples-Fermat's Last Theorem.

Books for Study :

- S.B.Malik ,” Basic Number Theory”,Second Revised Edition, Vikas Publishing House

PVT LTD, 2009

Unit I – Chapter : 1&2

Unit II – Chapter Chapter : 3 , Chapter : 4 – 4.1 ,4.2

Unit III – Chapter : 4 – 4.3 , 4.4 & Chapter : 5

Unit IV – Chapter :6 ,7- 7.1 to 7.3

Unit V – Chapter : 7- 7.4 to 7.6 , Chapter : 8

Books for Reference :

- Ivan Niven and Herbert S Zuckerman, "An Introduction to the theory of Numbers", 3rd Edition, Wiley Eastern Ltd., New Delhi, 2000.

Programme: B.Sc., **Subject:** Mathematics

Semester: V **Course: Numerical Methods**

Course Type: Part – III/ Core Paper XII **Credits: 4**

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Studying Principles of Least Squares	Knowledge (Level 1)
Developing efficient algorithms for solving problems in Science, Engineering, and Technology.	Evaluation (Level 5)
Analyzing different aspects numerical solutions of algebraic and transcendental equations	Analyze (Level 4)
Identifying the basic concept of numerical differentiation and integration	Analyze (Level 4)
Solving solution to simultaneous linear equations	Evaluate (Level 5)

COURSE CONTENT

Unit I: Solution of Algebraic and Transcendental Equations: Bisection Method – Iteration Method –Condition for Convergence- Regula Falsi Method-Newton's Method.

Unit II: Solutions of simultaneous Linear Algebraic Equations: Gauss Elimination Method – Gauss Jordan Method –Method of Factorization-Gauss Jacobi – Gauss Seidel Method .

Unit III: Finite Differences: First and Higher Order Differences –Forward and Backward Differences –Properties of Operator - Differences of a Polynomial - Factorial Polynomials- Relation between the Operators Δ ,E and D- Summation of the series.

Unit IV: Interpolation- Gregory Newton Forward and Backward Formula – Gauss Forward and Backward Formula- Stirlings Formula- Interpolation with Unequal Intervals: Divided differences- Newton's Interpolation Formula-Lagrange's Interpolation Inverse Interpolation.

Unit V: Numerical Differentiation and Integration: Newtons Forward and Backward Difference Formula - Stirlings Formule to Compute Derivatives-Trapezoidal rule- Simpsons $1/3^{rd}$ and $3/8^{th}$

Books for Study :

- P.Kandasamy , K.Thilagavathi and K. Gunavathi, "Numerical Methods", S.Chand and

Company Ltd , New Delhi 2013.

Unit I – Chapter 3 -3.1 to 3.4

Unit II – Chapter 4 -4.1 ,4.2,4.4,4.7 to 4.9

Unit III – Chapter 5- 5.1 to5.4,5.7

Unit IV –Chapter 6, 7 -7.1 to 7.5 & 8

Unit V – Chapter 9

Books for Reference :

- Arumuga, Issac, Somasundaram,"Numerical Analysis", New Gamma Publishing House, Palayam Kottai 2003.
- G. Balaji, "Numerical Methods", G.Balaji Publishers, Chennai 2007.

Programme: B.Sc., **Subject:** Mathematics

Semester: V **Course:** Programming in C

Course Type: Part – III/ Elective Paper XII **Credits: 3**

Hours Required: 3 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Studying basic structure of C program	Knowledge (Level 1)
Developing program skills in C and its object oriented concepts	Evaluation (Level 5)
Analyzing conditional statements and loop concept	Analysis (Level 4)
Identifying object oriented programming concept and proficient in C tokens	Evaluate (Level 5)
Understanding C operators, class declaration and Definition and its objects	Comprehension (Level 2)

COURSE CONTENT

Unit I: Overview of C :Importance of C - Sample C Programs - Basic structure of C program- Programming style - Executing a C Program. Constants, Variables and Data types **:** – Character set – C tokens – Keywords and Identifiers – Constants – Variables – Data types – Declaration of Variables – Assigning Values to Variables – Defining Symbolic Constants.

Unit II: Operators and Expression : Arithmetic of Operators – Relational Operators – Logical Operators – Assignment Operators- Increment and decrement Operators – Conditional Operator – Bitwise Operators- Special Operators – Arithmetic Expressions – Evaluation of Expressions – Precedence of Arithmetic Operators – Some Computational Problems – Type Conversions in Expressions – Operator Precedence and Associativity – Mathematical Functions.

Unit III: Managing Input and Output Operations: Reading a Character – Writing a Character – Formatted Input – Formatted Output.

Unit IV: Decision Making and Branching **:** Decision making with IF statement – Simple IF statement – The IF ELSE statement – Nesting of IF … ELSE statements – The ELSE IF ladder – The switch statement – The ? : operator- The GOTO statement.

Unit V: Decision Making and Looping : The WHILE statement – The DO statement – The FOR statement – Jumps in loops.

Books for Study :

- E.Balagurusamy, "Programming in ANSI C" , 4th Edition , Tata McGraw- Hill Publishing Company Ltd., New Delhi, Ninth Reprint 2009.

Unit I – Chapter 1&2

Unit II – Chapter 3

Unit III –. Chapter 4

Unit IV– Chapter5

Unit V – Chapter 6

Books for Reference :

- Kris A.Jamsa, " Programming in C", Gazlgotia Publication, New Delhi 1990.
- V.Rajaraman, "Computer Programming in C", Prentice Hall of India, New Delhi, 1994.
- Stephen .G Kochan, " Programming in C", CBS Publishers, New Delhi, 1991.

Programme: B.Sc., **Subject:** Mathematics

Semester: V **Course: Mathematical Methods**

Course Type: Part – IV/ SBE III **Credits: 2**

Hours Required: 2 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Applying graphs, charts, and probability techniques on various problems	Application (Level 3)
Developing skills in numerical and quantitative Techniques	Evaluation (Level 5)
Creating the time taken for performing job functions	Synthesis (Level 6)
Demonstrating various principles involved in solving mathematical problems	Analyze (Level 4)
Evaluating various real life situations by resorting to analysis of key issues and factors	Evaluation (Level 5)

COURSE CONTENT

Unit I: Problems on Ages-Time and Work-Time and Distance- Problems on Trains

Unit II: Permutation and Combination-Odd Man out Series

Unit III: Coding-Decoding- puzzle test .

Unit IV: Direction sense test –Logical venn diagrams.

Unit V: Logic- Statement – Assumptions-Arguments- Statements-Conclusion-Deriving conclusion from passages.

Books for Study :

- R.S.Agarwal, "Quantitative Aptitute For Competitive exams" 7 th revised edition
- R.S.Agarwal,"A Modern Approach to Verbal and Non-verbel Reasoning "3 th revised edition

Unit I- TB1: Chapter 8,15,17,&18

Unit II- TB1:Chapter 30&35

Unit III- TB2:Part I-Section I-Chapter 4&6

Unit IV- TB2:Part I-Section I-Chapter 7&9

Unit V- TB2:Part I-Section I-Chapter 1,2,3,5&6

Programme: B.Sc., **Subject:** Mathematics

Semester: VI **Course: Linear Algebra**

Course Type: Part – III/ Core Paper XIII **Credits: 4**

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Introducing the fundamentals of Vector spaces.	Knowledge (Level 1)
Recognizing the basic properties of vector spaces	Evaluation (Level 5)
Understanding the concepts of linear algebra in geometric point of view	Comprehension (Level 2)
Visualizing linear transformations as a matrix form	Synthesis (Level 6)
Formulating the importance and applications of linear algebra in many branches of mathematics	Application (Level 3)

COURSE CONTENT

Unit I: Vector spaces: Definition and examples – Properties of vector space-Linear combination –linear span – linear dependence and independence .

Unit II: Basis and Dimension – Quotient space – Isomorphism of vector spaces –Direct sums.

Unit III: Matrix of a linear transformation **-** Rank and nullity of a Linear transformation- characteristic equation of a matrix- Matrix Polynomial – Elementary matrix and transformations.

Unit IV: Row rank ,column rank and rank of a matrix-Row space and column space – linear equation –consistency of equation – non homogeneous linear system.

Unit V: Similar and Congruvant matrices-Inner product spaces : Definition and examples – Orthogonality –Orthogonalization - Orthogonal complement

Books for Study :

- T.K.Manickavasagampillai and Narayanan, "Modern Algebra"volume II Viswanathan printers and publishers Pvt Ltd., Edition 1982.

  Unit I- Chapter 8 -8.1 to 8.5

  Unit II- Chapter 8 -8.6 to 8.10

  Unit III- Chapter 8 -8.14 to 8.18

Unit IV- Chapter 8 -8.20 ,8.21

Unit V-Chapter 8 -8.22 to 8.24

Books for Reference :

Arumugam S and Thangapandi Issac ," Modern Algebra", SCITECH Publications, Chennai, Edition 2003.

A.R.Vasishtha, "Modern Algebra", Krishna Prakashan Mandir, Meerut, 1994 – 95

Programme: B.Sc., **Subject:** Mathematics

Semester: VI **Course: Complex Analysis**

Course Type: Part – III/ Core Paper XIV **Credits: 4**

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Introducing the concepts of complex numbers and analytic functions.	Knowledge (Level 1)
Learning will acquire basic concepts of analytic function and its properties	Knowledge (Level 1)
Finding integral values of complex function using residues	Evaluate (Level 5)
Gaining knowledge of integration of complex valued function	Knowledge (Level 1)
Solving problems of Residues Functions	Evaluate (Level 5)

COURSE CONTENT

Unit I: Analytic functions – Cauchy-Riemann equations – Sufficient conditions – Harmonic functions – Cauchy- Riemann equations in polar co-ordinates – Milne Thomson‟s method. - Conformal Mapping- Bilinear Transformation.

Unit II : Complex integration – Cauchy‟s integral theorem – Cauchy‟s integral formula – Derivatives of analytic functions – Morera‟s theorem – Cauchy‟s inequality – Liouville‟s theorem – Fundamental theorem of algebra

Unit III : Expansion of functions in power series– Taylor's theorem – Taylor's series and Laurent‟s series

Unit IV : Zero s of an analytic function-singular points - essential singularity - study of the function for the infinite value of Z- Argument Principle – Rouche‟s theorem - Fundamental theorem of algebra

Unit V : Calculus of Residues – Introduction- Residues - Cauchy's Residue Theorem - evaluation of definite integrals .

Books for Study :

- Arumugam S and Thangapandi Issac ," Complex Analysis", Scitech Publication pvt ltd,

Edition 2014.

Unit I – Chapter 2&3

Unit II – Chapter 6

Unit III – Chapter 7 -7.0 to 7.2

Unit IV – Chapter 7 -7.3 ,7.4

Unit V – Chapter 8

Books for Reference :

- Santhinarayan, "Theory of functions of Complex Variable', S.Chand and Company, Meerut,1995.
- T.K.M.Pillay, Dr.S.P.Rajagopalan & Dr.R.S. Sattanathan,"Complex Analusis", S. Viswanathan (Printers & Publisers),Pvt.Ltd. Revised Edition 2007 Reprint 2013.
- Lars V Ahlfors "Complex Analysis" McGraw – Hill Kogakusha, Ltd. 3rd Edition, 1999.

Programme: B.Sc., **Subject:** Mathematics

Semester: VI **Course:** Operations Research II

Course Type: Part – III/ Core Paper XV **Credits: 4**

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Studying to impart mathematical modelling skills through operations research techniques.	Knowledge (Level 1)
Learning will become proficient in sequence modelling and processes in mathematics and engineering.	Knowledge (Level 1)
Understanding the concept of Simulation	Comprehension (Level 2)
Analyzing the basics in game theory and replacement problems	Analysis (Level 4)
Applying the role and application of PERT/CPM for project scheduling.	Application (Level 3)

COURSE CONTENT

Unit I: Sequencing models and related problems: Sequencing Problems- assumption in Sequencing Problems – processing n jobs through one machine - processing n jobs through two machines - processing n jobs through three machines - processing 2 jobs through m machines - processing n jobs through m machines – solution of complicated Sequencing Problems- problems related to sequencing(routing problem in networks) – minimal path problem(shortest acyclic route models).

Unit II: Simulation: Introduction-when to use Simulation?- what is Simulation?- advantage of the Simulation technique- limitatioin of the Simulation- application of Simulation- Monte Carlo Simulation – generation of random numbers – Simulation languages.

Unit III: Theory of Games: Two person zero sum game-The maximin and minimax principle-Games without saddle points-Mixed strategies-Dominance property-solution of 2×2 rectangle game- Graphical Method.

Unit IV: Replacement Problem: Replace problem and System Reliability – Replacement of Equipment that Deteriorates Gradually- Replacement of Equipmant the Fails Suddently.

Unit V: Network Seduling by PERT/CPM: Introduction network and Basic Components- Rules of Construction – Critical Path Analysis – Probability Considerations in PERT – Distinction between PERT and CPM.

Books for Study :

- Kantiswarup, Gupta, P.K.Manmohan, "Operations Research" , Sultanchand and sons Edition 2002 ,Reprint 2017.

Unit I – Chapter 12

Unit II – Chapter 22

Unit III – Chapter 17

Unit IV – Chapter 18

Unit V – Chapter 25

Books for Reference :

- P.K.Gupta and D.Shira**,** Operations Research (S.Chand and Company Ltd New Delhi-.1992, Reprint 1994.
- Taha H.A.**,** Operations Research, "An introduction Prennce Hall of India Private Ltd 1st Edition New Delhi (2008) .

Programme: B.Sc., **Subject:** Mathematics

Semester: VI **Course: Graph Theory**

Course Type: Part – III/ Core Paper XVI **Credits: 4**

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Acquiring knowledge of different types of graphs.	Knowledge (Level 1)
Understanding different Models of a graph	Comprehension (Level 2)
Analyzing to solve different real life problems	Analysis (Level 4)
Applying many techniques to solve a particular problem	Application (Level 3)
Gaining knowledge about directed graphs.	Knowledge (Level 1)

COURSE CONTENT

Unit I: Graphs –Pictorial representation- subgraphs-Isomorphism and degrees- Walks and connected graphs- cycles in graphs –cut –vertices and cut edges.

Unit II: Eulerian and Hamiltonian graphs:Eulerian graphs - Fleury's Algorithm - Hamiltonian Graphs – Weighted graphs.

Unit III: Bipartite Graphs: Bipartite graphs-Marriage problem-trees.Matrix representations.

Unit IV: Planar Graphs: Planer graphs- Euler's Formula –Platonic solids-Dual of a plane graphs-Characterization of planer graphs.

Unit V: Directed Graphs:Directed graphs-Connectivity in diagraphs-Strong orientation of graphs-Eulerian digraphs-Tournaments.

Books for Study:

- S.A.Choudum, "A first Course in Graph Theory", Macmillan india limited,1999.

Unit I: Chapter 1

Unit II: Chapter 2

Unit III: Chapter 3 -3.1 to 3.3 &4-4.1

Unit IV: Chapter 5

Unit V: Chapter 7

Books for Reference:

- Arumugam S and Thangapandi Issac ," Graph theory", Scitech Publication pvt ltd, Edition 2014.
- S.A.Choudum, "A first Course in Graph Theory", Macmillan india limited,2007.

Programme: B.Sc., **Subject:** Mathematics

Semester: VI **Course:** Fuzzy sets and Fuzzy Numbers

Course Type: Part – III/ Core Paper XVII **Credits: 4**

Hours Required: 5 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Recognizing the concept of fuzzy sets and its properties.	Application (Level 3)
Studying fuzzy sets from crisp sets.	Knowledge (Level 1)
Analyzing various types on fuzzy sets.	Analysis (Level 4)
Understanding the fuzzy numbers and fuzzy Lattice relations.	Comprehension (Level 2)
Developing the concept of fuzzy sets and its properties.	Analysis (Level 4)

COURSE CONTENT

Unit I: From classical (crisp) sets to Fuzzy sets – Introduction – Crisp sets: An overview – Fuzzy sets: Basic types - Fuzzy sets: Basic concepts.

Unit II : Fuzzy sets vs Crisp sets: Additional properties of alpha(α)-cuts – Representations of fuzzy sets- Extension Principle for fuzzy sets.

Unit III : Operations on fuzzy sets : Types of operations – Fuzzy complements- Fuzzy intersections: t – Norms- Fuzzy unions : t – Conorms - Combinations of operations.

Unit IV : Aggregation operations - Fuzzy Numbers – Linguistic Variables-Arithmetic Operations on Intervals - Arithmetic Operations on Fuzzy numbers.

Unit V : Lattice of Fuzzy numbers - Fuzzy equations- Crisp vs Fuzzy Relations – Projections and Cylindric Extension – binary Fuzzy Relations – Binary Relations on a Single Set- Fuzzy Equivalence Relations.

Books for Study :

- George J. Klir / Bo Yuan, Fuzzy sets and Fuzzy Logic, Theory and Applications, Prentice Hall of India Pvt. Ltd., New Delhi, 2008.

  Unit – I : Chapter 1: Sections 1.1 – 1.4

  Unit – II : Chapter 2: Sections 2.1 - 2.3

Unit – III: Chapter 3: Sections 3.1 - 3.5

Unit – IV: Chapter 3: Sections 3.6 and Chapter 4: Sections 4.1 -4.4

Unit – V : Chapter 4: Sections 4.6 and Chapter 5: Sections 5.1 – 5.5

Books for Reference :

- George J. Klir & Tina A. Folger "Fuzzy Sets, Uncertainty & Information" PHI Learning Private Limited, 2012.
- D. Driankov, Hellendoorn & M. Reinfrank "An Introduction to Fuzzy Control" Narosa Publishing House, Reprint 2001.

Programme: B.Sc., **Subject:** Mathematics

Semester: VI **Course: Programming in C++**

Course Type: Part – III/ Elective Paper IV **Credits: 3**

Hours Required: 3 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Developing skills in C++ and its object oriented concepts.	Evaluate (Level 5)
Learning will become proficient in object oriented programming concept and proficient in C++ tokens	Knowledge (Level 1)
Studying in C++ operators	Knowledge (Level 1)
Analyzing the C++ class declaration and definition and its objects	Analysis (Level 4)
Solving to constructors and destructors programs	Evaluation (Level 5)

COURSE CONTENT

Unit I: Principles of Object- Oriented Programming**:** Software crisis – Software evolution – A look at procedure-oriented programming – Object oriented programming paradigm – Basic concept of Object -oriented programming – Benefits of OOP – Object Oriented Languages – Applications of OOP.

Unit II: Tokens, Expressions and Control Structures**:** Introduction – Tokens – Keywords – Identifiers and constants – Basic data types – User Defined data types – Derived data types – Symbolic constants – Type compatibility – Declaration of variables – Dynamic initialization of variables – Reference variables – Operators in C++ - Scope resolution operator – Member Dereferencing operators - Memory management operators – Manipulators – Type cast operator – Expressions and their Types – Special assignment expressions – Implicit conversions – Operator overloading – Operator precedence – Control structures.

Unit III: Functions in C++:Introduction – The main function – Function prototyping – Call by reference – Return by reference- Inline functions – Default arguments – Constant arguments – Function overloading – Friend and Virtual Functions – Math Library functions. Managing Console I/O operations Introduction – C++ streams - C++ stream classes – Unformatted I/O

operations – Formatted Console I/O operations – Managing Output with Manipulators.

Unit IV: 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.

Unit V: Constructors and Destructors: Introduction – Constructors – Parameterized Constructors – Multiple constructors in a Class – Constructors with Default Arguments – Dynamic Initializations of objects – Copy Constructor-Destructors

Books for Study:

- E. Balaguruswamy, "Object - Oriented Programming with C++", Tata McGraw Hill Education Private Limited, New Delhi, Tenth Reprint 2010.

  Unit I – Chapter 1 & 2

  Unit II – Chapter 3

  Unit III -Chapter 4 & 10

  Unit IV – Chapter 5-5.1 to 5.10

  Unit V – Chapter 6-6.1 to 6.7,6.11`

Books for Reference :

- Ashok N.Kamthane, "Object Oriented Programming with ANSI and TURBO C++",

  Pearson Education (P) Ltd, 2003.
- Bjarme Stroustrup, " The C++ Programming Language", AT & T Labs, Murray Hill, New Jersey, 1998.

Programme: B.Sc., **Subject:** Mathematics

Semester: VI **Course: Numerical Methods Lab using C++**

Course Type: Part – IV/ SBE IV **Credits:** 2

Hours Required: 2 Hrs / Week

CIA: 25 **CA:** 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description	Blooms' Taxonomy Level
Developing skills in C++ and its object oriented concepts.	Evaluation (Level 5)
Learning will become proficient in object oriented programming concept and proficient in C++ Language	Knowledge (Level 1)
Applying Numerical Method concepts and writing program	Application (Level 3)
Analyzing the C++ class declaration and definition and its objects	Analyze (Level 4)
Applying various types of methods and solving system of Equations	Application (Level 3)

COURSE CONTENT

1. Write a Program to find the Smallest positive / Largest negative root using simple iteration method
2. Write a Program to find the Smallest positive / Negative root using Regula Falsi method.
3. Write a Program to find the Smallest positive / Negative root using Newton-Raphson's i method.
4. Write a Program to find the solution of system of equation using Gauss Jacobi method..
5. Write a Program to find the Matrix inversion using Gauss Jordan method
6. Write a Program to interpolate y for given x from the given sets of values of x and y by Newton's forward method.
7. Write a Program to find interpolate y for given x from the given sets of values of x and y by Newton's backward method.
8. Write a Program to find interpolate y using the Lagrange's method
9. Write a Program to derivative at initial point by Newton's forward method
10. Write a Program to integration using Trapezoidal & simpson's method

Books for Study :

T.Veerarajan & T.Ramachandran, “Theory and Problems in Numerical Methods with Programs in C and C++”, Tata McGraw Hill Publishing Company Ltd, 2004.