Annexure -5

E.M.G. YADAVA WOMENS COLLEGE, MADURAI -14.

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)
(Re –accredited (3rd Cycle) with Grade A+ and CGPA 3.51 by NAAC)

TANSCHE – CBCS WITH OBE

DEPARTMENT OF MATHEMATICS –UG

COURSE STRUCTURE
(w.e.f. 2023 – 2024 Batch onwards)

Semester	Part	Course Code	Course Title	Teaching hrs (per week)	Duration of Exam (hrs.)	Marks Allotted			Credits
						CIA	SE	Total	
I	I	23OU1TA1/ 23OU1HIN1/ 23OU1FR1	**Part I:**Tamil /Hindi/French	6	3	25	75	100	3
	II	23OU2EN1	**Part II:** General English-I	6	3	25	75	100	3
	III	23OUMA11	**CC-1:**Algebra & Trigonometry	4	3	25	75	100	4
		23OUMA12	**CC-2:** Differential Calculus	4	3	25	75	100	4
		23OUMAGECH1/ 23OUMAGEPH1	**GEC-1**:Chemistry for Physical Science –I/Physics	4	3	25	75	100	3
		23OUMAGECH1P/ 23OUMAGEPH1P	Chemistry Practical for Physical Science –I /Physics Practical	2	3	40	60	100	2
	IV	23OUMASECN1	**SEC-1:** Mathematics for Competitive Exam –I (NME)	2	3	25	75	100	2
		23OUMAFC1	**FC:** Bridge Mathematics	2	3	25	75	100	2
II	I	23OU1TA2/ 23OU1HIN2/ 23OU1FR2	**Part I:**Tamil /Hindi/ French	6	3	25	75	100	3
	II	23OU2EN2	**Part II:** General English-II	6	3	25	75	100	3
	III	23OUMA21	**CC-3 :**Analytical Geometry (2D&3D)	4	3	25	75	100	4
		23OUMA22	**CC-4:**Integral Calculus	4	3	25	75	100	4
		23OUMAGECH2/ 23OUMAGEPH2	**GEC-2:** Chemistry for Physical Science –II /Physics	4	3	25	75	100	3
		23OUMAGECH2P 23OUMAGEPH2P	Chemistry Practical For Physical Science –II /Physics Practical	2	3	40	60	100	2
	IV	23OUMASECN2	**SEC-2** Mathematics For Competitive Exam –II (NME)	2	3	25	75	100	2
		23OUMASEC3	**SEC-3** Computation Mathematics	2	3	25	75	100	2
	I	23OU1TA3/ 23OU1HIN3/ 23OU1FR3	**Part I:**Tamil /Hindi/French	6	3	25	75	100	3
	II	23OU2EN3	**Part II:**General English-III	6	3	25	75	100	3
	III	23OUMA31	**CC-5 :** Vector Calculus and Applications	5	3	25	75	100	4

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III		23OUMA32	**CC-6:** Differential Equations and Applications	4	3	25	75	100	4
		23OUMAGECH3/ 23OUMAGECS3	**GEC-3**: Chemistry for Physical Sciences-III / Python Programming	3	3	25	75	100	3
		23OUMAGECH3P/ 23OUMAGECS3P	Chemistry Practical for Physical Sciences –III / Python Programming Lab	2	3	40	60	100	2
	IV	23OUMASEC31P	**SEC-4:** Latex Lab	2	3	40	60	100	2
		23OUMASEC32	**SEC-5:** Mathematics for Competitive Examinations	1	2	25	75	100	1
		23OU4EV4	Environmental Studies	1	-	-	-	-	-
IV	I	23OU1TA4/ 23OU1HIN4/ 23OU1FR4	**Part I:** Tamil /Hindi/French	6	3	25	75	100	3
	II	23OU2EN4	**Part II:**General English-IV	6	3	25	75	100	3
	III	23OUMA41	**CC-7** : Industrial Statistics	4	3	25	75	100	4
		23OUMA42	**CC-8:** Elements of Mathematical Analysis	4	3	25	75	100	4
		23OUMAGECH4/ 23OUMAGECS4	**GEC-4**: Chemistry for Physical Sciences-IV/ Introduction to Data Science	3	3	25	75	100	3
		23OUMAGECH4P/ 23OUMAGECS4P	**GEC-4**: Chemistry Practical for Physical Sciences-IV/ Data Science Lab	2	3	40	60	100	2
	IV	23OUMASEC41P	**SEC-6** R Programming Lab	2	3	40	60	100	2
		23OUMASEC42P	**SEC:7** Statistics using MS Excel Lab	2	3	40	60	100	2
		23OU4EV4	Environmental Studies	1	2	25	75	100	2
V	III	23OUMA51	**CC-9:** Abstract Algebra	5	3	25	75	100	4
		23OUMA52	**CC-10:**Real Analysis	5	3	25	75	100	4
		23OUMA53	**CC-11:**Mathematical Modelling	5	3	25	75	100	4
		23OUMA54	**CC-12:** Fourier Series & Transform Techniques	4	3	25	75	100	4
			DSEC I	4	3	25	75	100	3
			DSEC II	5	3	25	75	100	3
	IV	23OU4VE5	Value Education	2	3	25	75	100	2
		23OUMAIN5	Internship/Industrial Training	-	-	-	-	-	2
VI	III	23OUMA61	**CC-13:**Linear Algebra	6	3	25	75	100	4
		23OUMA62	**CC–14:**Complex Analysis	6	3	25	75	100	4
		23OUMA63	**CC-15:**Mechanics	6	3	25	75	100	4
			DSEC III	3	3	25	75	100	2
			DSEC III: Practical	2	3	40	60	100	1
			DSEC IV	5	3	25	75	100	3
	IV	23OUMASEC6	**SEC-8:** Essential Reasoning and Quantitative Aptitude	2	3	25	75	100	2
	V	23OU5PE6/ 23OU5NS6	Extension Activity(Physical Education/NSS)	-	-	-	-	-	1
						Total credits			140

CC-Core Course

GEC- Generic Elective Course

DSEC -Discipline Specific Elective Course

SEC-Skill Enhancement Course

FC- Foundation Course

Semester V:

DSEC I: Choose any one

Optimization Techniques – 23OUMADSE5A
Introduction to Machine Learning -23OUMADSE5B

DSEC II: Choose any one

Graph Theory and Applications – 23OUMADSE5C
Number Theory and Cryptography-23OUMADSE5D

Semester VI

DSEC III: Choose any one theory with respective practical

Programming in C++-23OUMADSE6A
Programming in C++ Practical-23OUMADSE6AP
Programming in Java -23OUMADSE6B
Programming in Java Practical -23OUMADSE6BP

DSEC IV: Choose any one

Numerical Methods -23OUMADSE6C
Discrete Mathematics -23OUMADSE6D

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Department of Mathematics						III B.Sc.		
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
V	Core	23OUMA51	Abstract Algebra	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives:

- To determine the Concepts of Sets, Groups and Rings.
- To understand the properties of special groups like cyclic and permutation groups.
- To analyze the construction, characteristics and applications of the abstract algebraic structures
- To classify the definitions and properties of rings, fields, and their related concepts

Course Content:

UNIT- I:

Definition of a Groups - Some examples of Groups –Some Preliminary Lemmas-Subgroups-A counting principle

UNIT- II:

Normal subgroups and Quotient groups- Homomorphisms - Automorphisms

UNIT-III:

Cayley's Theorem-Permutation Groups

UNIT – IV:

Definition and Examples of Rings- Some special classes of Rings- homomorphisms, of rings- Ideals and quotient Rings- More Ideals and Quotient Rings

UNIT-V:

The Field of Quotients of an Integral Domain-Euclidean Rings - A particular Euclidean

Book for study:

Topics in Algebra–I.N.Herstein, Wiley Eastern Ltd. Second Edition

(1st January 2006)

Chapters:

UNIT-I Chapter 2 Section:2.1 to 2.5
UNIT-II Chapter 2 Section:2.6 to 2.8
UNIT-III Chapter 2 Section:2.9 and 2.10

UNIT-IV Chapter 3 Section:3.1 to 3.5

UNIT-V Chapter 3 Section: 3.6 to 3.8

Books for Reference:

1. John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
2. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.
Joseph A Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa, 1999.

Web Resources/E Books:

https://www.open.edu/openlearn/mod/resource/view.php?id=72698

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill:

Gain knowledge of group theory, ring theory, and field concepts including subgroups, homomorphisms, and quotient structures.
Develop skills to analyze algebraic structures, apply fundamental theorems, and understand special rings and fields for abstract algebra problems.

Activities to be given:

We will be providing students with intellectual problems, group discussion and also insists them to check reference books and web resources.

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Explain groups, subgroups and cyclic groups	Up to K4
CO2	Explain about Normal subgroup, Quotient groups, Homomorphisms and Automorphisms and verify the functions for homomorphism and automorphism properties	Up to K4
CO3	Explain Permutation groups and apply Cayley's theorem to problems	Up to K4
CO4	Explain Rings, Ideals and Quotient Rings and examine their structure	Up to K5
CO5	Discuss about the field of quotient of an integral domain and to Explain in detail about Euclidean Rings	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	3	1	-
CLO2	3	3	2	3	1	-
CLO3	3	3	2	3	2	-
CLO4	3	3	2	3	1	-
CLO5	3	3	2	3	2	-

1. Basic level 2. Intermediate level 3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	Introduction to groups- Subgroups- cyclic groups and properties of cyclic groups- Lagrange's Theorem-A counting principle – Examples	**15**	Chalk and Talk
II	Normal subgroups and Quotient group- Homomorphism- Automorphism -Examples.	**15**	Chalk and Talk
III	Cayley's Theorem-Permutation groups – Examples	**15**	Chalk and Talk
IV	Definition and examples of ring- Some special classes of rings- homomorphism of rings- Ideals and quotient rings- More ideals and quotient rings	**15**	Chalk and Talk
V	The field of quotients of an integral domain- Euclidean Rings - The particular Euclidean Ring – Examples	**15**	Chalk and Talk, Seminar
Total		**75**	

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Department of Mathematics						III B.Sc.		
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
V	Core	23OUMA52	Real Analysis	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives:

1. To introduce the structure and properties of metric spaces.
2. To study concepts of continuity, compactness, and completeness in metric spaces.
3. To understand Riemann inerrability and its essential properties.
4. To apply fundamental theorems of differential calculus.
5. To analyze pointwise and uniform convergence of function sequences.

Course Content:

UNIT- I: Continuous Functions on Metric Spaces: Open sets- closed sets-Discontinuous function on R^1. Connectedness, Completeness and Compactness: More about open sets-Connected sets.

UNIT- II: Bounded sets and totally bounded sets: Complete metric spaces-compact metric spaces, continuous functions on a compact metric space, continuity of inverse functions, uniform continuity.

UNIT- III: Calculus: Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral-properties of Riemann integral.

UNIT -IV: Derivatives- Rolle's theorem, Law of mean, Fundamental theorem of calculus.

UNIT –V: Taylor's theorem-Point wise convergence of sequences of functions, uniform convergence of sequences of functions.

Book for study:

Methods of Real Analysis-Richard R.Goldberg (John Wiley & sons, 2nd Edition) (Indian edition-Oxford and IBH Publishing Co, New Delhi, 1st January 2020)

Chapters:

UNIT I: Chapter 5: sections 5.4 to 5.6 & Chapter 6 sections 6.1, 6.2

UNIT II: Chapter 6: sections 6.3 to 6.8

UNIT III: Chapter 7 sections 7.1 to 7.4

UNIT IV: Chapter 7 Sections 7.5 to 7.8

UNIT V: Chapter 8 sections 8.5 & Chapter 9 sections 9.1 and 9.2

Books for Reference:

1. Principles of Mathematical Analysis by Walter Rudin, Tata McGraw Hill Education, Third edition (1 July 2017).
2. Mathematical Analysis Tom M A postal, Narosa Publishing House, 2nd Edition (1974), Addison-Wesley publishing company, New Delhi.

Web Resources/E Books:

1. **https://nptel.ac.in**
2. https://r.search.yahoo.com/_ylt=AwrKEo1arj5osvUNX4jnHgx.;_ylu=Y29sbwMEcG9zAzIEdnRpZAMEc2VjA3Ny/RV=2/RE=1748967131/RO=10/RU=https%3a%2f%2fwww.mathcity.org%2fnotes%2freal-analysis-notes-by-prof-syed-gul-shah/RK=2/RS=dEfo2FuLaGdbiYtZNHEPkQgeeMs-

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill:

Understand the foundational concepts of metric spaces, continuity, compactness, connectedness, and Riemann integration.

Develop skills to analyze function behavior, apply key theorems like Rolle's and Taylor's, and evaluate convergence of function sequences rigorously.

Activities to be given:

We will be providing students with intellectual problems, group discussion and also insist them to check reference books and web resources.

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Explain the concepts of Continuous and Discontinuous functions	Up to K4
CO2	Explain the concepts of bounded and totally bounded sets, continuity of inverse functions and Uniform continuity	Up to K4
CO3	Define the sets of measure zero, to Explain about the existence and properties of Riemann Integral	Up to K4
CO4	Explain the concept of differentiability and to Explain Rolle's theorem, Law of mean, and Fundamental theorem of calculus.	Up to K5
CO5	Explain the pointwise uniform convergence of sequence of function and to derive the Taylor's theorem.	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4-Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	1	4	1	-
CLO2	3	3	1	1	-	-
CLO3	3	2	1	3	2	-
CLO4	3	3	1	3	-	-
CLO5	3	3	1	3	-	-

1. Basic level 2. Intermediate level 3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	Continuous Functions on Metric Spaces: Open sets- closed sets-Discontinuous function on R^1. Connectedness, Completeness and Compactness: More about open sets-Connected sets.	15	Lecture, Quiz
II	Bounded sets and totally bounded sets: Complete metric spaces-compact metric spaces, continuous functions on a compact metric space, continuity of inverse functions, uniform continuity.	15	Chalk and Talk, Group Discussion
III	Calculus: Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral-properties of Riemann integral.	15	Lecture, Problem Solving
IV	Derivatives- Rolle's theorem, Law of mean, Fundamental theorem of calculus.	15	Lecture, Quiz
V	Taylor's theorem-Point wise convergence of sequences of functions, uniform convergence of sequences of functions.	15	Lecture, Seminar
Total		**75 hours**	

Department of Mathematics						Class:III B.Sc.		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**SE**	**Total**
V	Core	23OUMA53	Mathematical Modelling	4	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives:

- To understand the fundamentals of mathematical modelling.
- To model real-world problems using first-order differential equations.
- To analyze dynamic systems using systems of differential equations.
- To introduce basic concepts of difference equations.
- To apply difference equations in economic and actuarial models.

Course Content:

UNIT- I: Mathematical Modelling: Simple situations requiring mathematical modelling,The technique of mathematical modelling-classification of mathematical models –Some characteristics of mathematical models.

UNIT- II: Mathematical Modelling through ordinary differential equations of first order: Linear Growth and Decay Models - Non-Linear growth and decay models - Compartment models.

UNIT- III: Mathematical Modelling through systems of ordinary differential equations of the first order : Prey-predator models- Competition models – Multi-species models - Age –structured population models. Mathematical Modelling of epidemics through systems of ordinary differential equations of first order : A simple epidemic model - A Susceptible-infected- susceptible (SIS) model - SIS model with constant number of carriers – simple epidence model with carriers - Model with removal-Model with removal and immigration - Model in medicine: A Model for Diabetes Mellitus

UNIT – IV: Basic theory of linear difference equations with constant coefficients: The linear difference equation-The particular solution- Obtaining complementary function by use of matrices -Solution of a system of linear homogeneous difference equations with constant coefficients-Solution of linear difference equations by using laplace transform and z-transform-Solution of non-linear difference equations reducible to linear equations-Stability theory for difference equations.

UNIT- V: Mathematical Modelling through difference equations in economics and finance: The Harrod Model-The cobweb model-Samuelson’s interaction models- Application to Actuarial Science.

Book for study:

Mathematical Modeling, J N Kapur New Age International publishers(2009).

Chapters:

UNIT 1: Chapter 1 – sections 1.1. to 1.4

UNIT II Chapter 2 – sections 2.1 to 2.4

UNIT III Chapter 3 – Sections 3.1 , 3.2, and 3.5.1

UNIT IV Chapter 5 – Sections 5.2 :5.2.1 to 5.2.9

UNIT V Chapter 5 - Section 5.3: 5.3.1 to 5.3.4

Books for Reference:

1. Mathematical Modeling by Bimalk. Mishra and Dipak K.Satpathi. Ane Books Pvt. Ltd(1 Januuary 2009)
2. Mathematical Modeling Models, Analysis and Applications, by Sandip Banerjee, CRC Press, Taylor & Francis group, 2014
3. Mathematical Modeling applications with Geogebra by Jonas Hall & Thomas Ligefjard, John Wiley & Sons, 2017

Web Resources/E Books:

https://mathworld.wolfram.com/
https://tutorial.math.lamar.edu/

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill Understand the fundamental concepts and types of mathematical models.

Gain knowledge of modelling real-life situations using differential and difference equations.

Activities to be given: We will be providing students with intellectual problems, group discussion and also insists them to check reference books and web resources.

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Explain simple situations requiring Mathematical Modelling and to Determine the characteristics of such models	Up to K4
CO2	Model using differential equations in-terms of linear growth and Decay models	Up to K4
CO3	Model using systems of ordinary differential equations of first order, to discuss about various models under the categories 'Epidemics' and 'Medicine'	Up to K4
CO4	Explain in detail about difference equations	Up to K5
CO5	Model using difference equations	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	3	3	3	2	-
CLO2	2	3	3	3	2	-
CLO3	2	3	3	3	2	-
CLO4	3	2	2	2	1	-
CLO5	2	3	3	3	2	-

1. Basic level 2. Intermediate level 3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	**UNIT- I:** Mathematical Modelling: Simple situations requiring mathematical modelling, characteristics of mathematical models.	**15**	Chalk and Talk
II	**UNIT- II:** Mathematical Modelling through differential equations: Linear Growth and Decay Models. Non-Linear growth and decay models, Compartment models.	**15**	Lecture , Group Discussion
III	**UNIT- III:** Mathematical Modelling, through system of Ordinary differential equations of first order: Prey-predator models, Competition models, Model with removal and model with immigrations. Epidemics: simple epidemic model, Susceptible-infected-susceptible (SIS) model, SIS model with constant number of carriers. Medicine: Model for Diabetes Mellitus.	**15**	Lecture ,Chalk and Talk, Quiz
IV	**UNIT – IV:** Basic theory of linear difference equations with constant coefficients: The linear difference equation-The particular solution-Obtaining complementary function by use of matrices - Solution of a system of linear homogeneous difference equations with constant coefficients-Solution of linear difference equations by using laplace transform and z-transform-Solution of non-linear difference equations reducible to linear equations-Stability theory for difference equations.	**15**	Seminar, Quiz
V	**UNIT- V:** Mathematical Modelling through difference equationsin economics and finance: The Harrod Model-The cobweb model-Samuelson's interaction models-Application to Actuarial Science.	**15**	Chalk and Talk. Seminar Quiz
	Total	**75 Hrs**	

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Department of Mathematics						III B.Sc.		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**SE**	**Total**
V	Core	23OUMA54	Fourier Series & Transform Techniques	4	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives:

- Understand Laplace Transforms and their applications to standard and periodic functions.
- Apply inverse Laplace Transforms to solve linear differential equations.
- Develop Fourier series for even, odd, and half-range functions.
- Explore the complex Fourier Transform and its properties.
- Use Fourier sine and cosine transforms with key theorems like convolution and Parseval's identity.

Course Content:

Unit I: The Laplace Transform: Definition -Sufficient conditions for the existence of the laplace transform-Laplace transform for standard functions -Laplace transform of periodic functions and Some general theorems.

Unit I : The Inverse Transform: Inverse Laplace transform of standard functions and Solve ordinary differential equations with constant coefficient using laplace transform

Unit III: Fourier Series: Even and odd functions-Half range Fourier series-Development of cosine series and Development of sine series.

Unit IV: Fourier Transforms: Complex form of Fourier Integral formula and Properties of Fourier transform

Unit V: Fourier Cosine and Fourier Sine Transforms: Fourier Cosine Transform-Fourier sine transform-Properties of F_c and F_s - Convolution Theorem- Parsival's Identity

Book for study:

S.Narayanan and T.K.Manicavachagam pillay Calculus –VolumeIII,S.Viswanathan(Printers & Publishers),Pvt., Ltd (2013)

Chapter 5: Page no. 154-173

Chapter 5: Page no. 174- 188

Chapter 6: Page no. 202- 226

Chapter 6: Page no. 247-253

Chapter 6: Page no. 254-269

Books for Reference:

- Kandasamy, Thilagavathy, & Gunavathi – *Engineering Mathematics Vol. II & III*, Reprint 2022. S. Chand & Company
- B.S. Grewal – *Higher Engineering Mathematics*, 44th Edition, 2023, Khanna Publishers.
- R.K. Jain & S.R.K. Iyengar – *Advanced Engineering Mathematics*, 4th Edition, 2019
- Narosa Publishing House.

Web Resources/E Books:

https://ocw.mit.edu/

https://tutorial.math.lamar.edu

https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SMTA1401.pdf

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill:

• **Knowledge:** Gain foundational understanding of Laplace and Fourier transforms, their properties, and applications in solving differential equations and signal analysis.

• **Skill:** Develop the ability to compute transforms, apply theorems, and solve engineering problems using analytical techniques.

Activities to be given:

• Solve problems involving Laplace and Fourier transforms through guided practice and assignments.

• Apply transform techniques to real-world engineering problems using differential equations.

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy(Up to Levels)
CO1	Learn to apply Laplace transforms to standard and periodic functions using basic theorems.	Up to K4
CO2	Solve ordinary differential equations using inverse Laplace transform techniques.	Up to K4
CO3	Construct Fourier series representations for various types of functions.	Up to K4
CO4	Understand and apply the complex form and properties of Fourier transforms	Up to K5
CO5	Use Fourier sine and cosine transforms to analyze signals and apply key theorems.	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	-	-	-	-
CLO2	3	3	-	2	-	-
CLO3	3	2	-		-	-
CLO4	3	3	-	2	-	-
CLO5	3	3	-	2	-	-

1. **Basic level** **2. Intermediate level** **3. Advanced level**

Lesson plan:

Unit	Description	Hours	Mode
I	Practice problems on standard functions. Derive Laplace transforms of periodic functions .Discuss and prove general theorems	**12**	Chalk and Talk/ Power Point Presentation
II	Step-by-step inverse transform examples. Solve ODEs using Laplace methods. Assign exercises involving initial value problems	**12**	Chalk and Talk/ Power Point Presentation
III	Identify even/odd functions through examples. Derive full and half-range series. Practice expanding functions into sine and cosine series	**12**	Chalk and Talk/ Power Point Presentation
IV	Derive the complex form of Fourier transform. Discuss key properties with examples. Practice applying properties to simple functions	**12**	Chalk and Talk/ Power Point Presentation
V	Define and compute Fc and Fs transforms. Prove and apply convolution theorem. Explore Parseval's identity through examples	**12**	Chalk and Talk/ Power Point Presentation
Total		**60**	

Department of Mathematics						III B.Sc.		
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
V	Core-Elective	23OUMADSE5A	Optimization Techniques	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	Entrepreneurship oriented

Course Objectives:

- To formulate and solve linear programming problems using graphical and simplex methods.
- To apply techniques for transportation, assignment, sequencing, and game theory problems.
- To solve inventory and waiting line problems using deterministic models.
- To understand and use project network diagrams.
- To apply Critical Path Method (CPM) for project management and scheduling.

Course Content:

UNIT- I: Linear programming: Requirements for employing Technique- Mathematical Formulation of L.P.P - Graphical method of a L.P.P - Some more cases

UNIT- II: General Linear Programming Problems- Simplex method-Artificial variables techniques- Big-M method

UNIT-III: Transportation problem: Formulation- Modi method- Degeneracy in transportation problem **Assignment problem**- Formulation -Comparison with Transportation Model-Hungarian Method

UNIT – IV: Game Theory: Introduction –Two person Zero-Sum Games-The Maximin-Minimax Principle- games without saddle points-mixed strategies-Arithmetic method- dominance property – Graphical Method for 2 X n or m X 2 games,

UNIT-V Network: Introduction –Basic Terminologies-Rules for constructing a project network diagram – Network computation-Float

Book for study:

V. Sundaresan, K.S. GanapathySubramaian and K.Ganesan, Resource Management Techniques. A.R Publications, 2002

Chapters:

UNIT-I Chapter 2- Section : 2.1to 2.6
UNIT-II Chapter 3- Section:3.1.1to 3.2.1
UNIT-III Chapter 7 -Section: 7.1 to 7.3
Chapter 8 - Section:8.1 to 8.5 ,
UNIT-IV Chapter 16- Section:16.1.1 to 16.7

UNIT-V Chapter 15 - Section: 15.1 to 15.5

(**All Units Problems only**)

Books for Reference:

1. Gupta P.K. and Hira D.S., Problems in Operations Research - S.Chand& amp; Co., 2014
2. Kanti Swaroop, Gupta P.K and Manmohan, Problems in Operations Research, Sultan Chand & Sons, 2014

Web Resources/E Books:

https://ocw.mit.edu/courses/sloan-school-of-management/15-053-optimization-methods-in-management-science-spring-2013/

https://www.tutorialspoint.com/operations_research/index.htm

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill:

Understand mathematical methods for optimization, inventory, queuing, and project management. Formulate and solve linear programming, transportation, sequencing, and project scheduling problems effectively.

Activities to be given:

We will be providing students with intellectual problems, group discussion and also insists them to check reference books and web resources.

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Formulate and solve linear programming problems using graphical and simplex methods confidently.	Up to K4
CO2	Use artificial variables techniques and the Big-M method to solve linear programming problems	Up to K4
CO3	Solve transportation problems, assignment problems, sequencing and theory of games problems and apply them to solve real-world problems.	Up to K4
CO4	Analyze waiting line problems using single-channel and multi-channel models and apply them to solve real-world problems.	Up to K5
CO5	Use project network diagrams and CPM technique for project management and scheduling	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analysing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	3	2	1	-
CLO2	3	1	3	2	1	-
CLO3	3	1	3	2	1	-
CLO4	3	1	3	2	2	1
CLO5	3	1	3	2	2	1

1. Basic level **2. Intermediate level** **3. Advanced level**

Annexure -5

Lesson plan:

Unit	Description	Hours	Mode
I	**Linear programming**: Requirements for employing Technique- Mathematical Formulation of L.P.P - Graphical method of a L.P.P - Some more cases	**12**	**Chalk and Talk,**
II	**General Linear Programming Problems**- Simplex Method-Artificial variables techniques- Big-M method	**12**	**Chalk and Talk,**
III	**Transportation problem**: Formulation- Modi method- Degeneracy in transportation problem **Assignment problem**- Formulation - Comparison with Transportation Model- Hungarian Method	**12**	**Chalk and Talk**
IV	**Theory Of Games:** Introduction – Terminology, Solution of games with saddle points and without saddle points, 2×2 games, dominance principle, m X 2 & 2 X n games, Graphical method	**12**	**Chalk and Talk**
V	**Network:** : Project Network diagram – CPM computation	**12**	**Chalk and Talk**
	Total **60**		

Department of Mathematics						III B.Sc.		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**SE**	**Total**
V	Core-Elective	23OUMADSE5B	Introduction To Machine Learning	3	4	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	Entrepreneurship oriented

Course Objectives:

- To introduce students to the concept of Machine Learning and its applications.
- To familiarize students with the different types of Machine Learning, such as Supervised, Unsupervised, Reinforcement Learning, and Deep Learning.
- To teach students about Classification and Model Selection

Course Content:

UNIT- I Introduction to Machine Learning & Python

Introduction to Machine Learning - Machine learning process Understanding Python: why Python, First Python program, Python Basics, data Structure and loops - Introduction to Pandas library- Importing and exploring data- Data cleaning and preprocessing– Data visualization: Line chart, Bar chart, pie chart, Box plot, - Seaborn: Distplot, Jointplot..

UNIT- II: Classification and Model Selection

Types of Machine Learning: Supervised, Unsupervised, Reinforcement Learning, deep learning - Classification of machine Learning Concepts - Distance based Machine learning methods – K Nearest Neighbor- classifications –Decision Tree learning-Naïve Bayes –Linear regression - Logistic Regression – Linear regression Models – Support Vector Machine

UNIT-III: Unsupervised Machine Learning

Introduction to Clustering Techniques - requirements of clustering Algorithm – Types of Clustering Method – Clustering strategies – Partitioning clustering -: K-Means Clustering - kernel K means

UNIT – IV: Hierarchical Clustering - Evaluation Metrics -Principal Component Analysis (PCA) – Kernel principle Component analysis

UNIT-V: Machine learning Algorithms

Designing Machine Learning Algorithms – classification Metrics – Regression Metrics – Statistical learning theory – Ensemble method

Book for study:

1.Machine Learning using Python by Manaranjan Pradhan and U Dinesh Kumar , Wiley, 2019

2. Machine Learning - V.K. Jain – Khanna Publishing Pvt. Ltd, 2018

Chapters:

UNIT-I Chapter 1- 1.1,1.2 up to page no. 6; Chapter 2 – 2.1,2.3,2.4,2.5;
Chapter 3 – 3.6 – 3.6.1 to 3.6.4 Chapter 4 – 4.1 to 4.7,4.8 – 4.8.1& 4.8.2

UNIT-II Chapter 1 – 1.2 to 1.15

UNIT III Chapter 2 – 2.1 to 2.9

UNIT IV Chapter 2 – 2.13 to 2.16:

UNIT V Chapter 3 – 3.1 to 3.6

Books for Reference:

1.Data Science and Machine Learning using Python – 2022 by Dr Reema Thareja, bpb Publication, 2020

2. Data Science and Machine Learning by N. Meenakshi and K. E. Rajakumari, 2021

https://nptel.ac.in

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill:

Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferable Skill

Activities to be given:

We will be providing students with intellectual problems, group discussion and also insists them to check reference books and web resources.

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Students will gain an understanding of the basics of Machine Learning, including its applications and types.	Up to K4
CO2	Students will gain knowledge of Classification and Model Selection techniques, including various distance-based Machine Learning methods.	Up to K4
CO3	Students will be able to implement and evaluate Unsupervised Machine Learning techniques such as Clustering and PCA	Up to K4
CO4	Students will be able to design Machine Learning Algorithms for classification and regression tasks and evaluate their performance using relevant metrics.	Up to K5
CO5	Students will be able to apply Statistical Learning Theory and Ensemble methods to improve Machine Learning algorithms' performance	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	2	3	2	1	1
CLO2	3	3	3	2	1	1
CLO3	3	3	3	2	1	-
CLO4	3	2	3	2	1	1
CLO5	3	3	3	2	1	-

1.Basic level **2. Intermediate level** **3. Advanced level**

Annexure -5

Lesson plan:

Unit	Description	Hours	Mode
I	**Introduction to Machine Learning & Python** Introduction to Machine Learning - Machine learning process Understanding Python: why Python, First Python program, Python Basics, data Structure and loops - Introduction to Pandas library- Importing and exploring data- Data cleaning and preprocessing– Data visualization: Line chart,	12	**Chalk and Talk, Group Discussion**
II	**Classification and Model Selection** Types of Machine Learning: Supervised, Unsupervised, Reinforcement Learning, deep learning -Classification of machine Learning Concepts - Distance based Machine learning methods – K Nearest Neighbor- classifications – Decision Tree learning-Naïve Bayes –Linear regression - Logistic Regression – Linear regression Models – Support Vector Machine.	12	**Lecture Group Discussion**
III	**Unsupervised Machine Learning** Introduction to Clustering Techniques - requirements of clustering Algorithm – Types of Clustering Method – Clustering strategies – Partitioning clustering -: K-Means Clustering - kernel K means.	12	**Lecture, Quiz**
IV	Hierarchical Clustering - Evaluation Metrics -Principal Component Analysis (PCA) – Kernel principle Component analysis.	12	**Lecture, Quiz**
V	**Machine learning Algorithms** Designing Machine Learning Algorithms – classification Metrics – Regression Metrics – Statistical learning theory – Ensemble methods.	12	**Chalk and Talk, Lecture**
	Total **60**		

Annexure -5

Department of Mathematics						III B.Sc.		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**SE**	**Total**
V	Core-Elective	23OUMADSE5C	Graph Theory and Applications	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives:

- Understand basic graph theory concepts such as subgraphs, isomorphism, and connectivity.
- Analyze Eulerian and Hamiltonian graphs and apply related algorithms.
- Apply graph theory to bipartite graphs, trees, and matrix representations.
- Explore planar graphs and their properties using Euler's formula and duality.
- Learn graph coloring techniques and study the basics of directed graphs.

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 graphs - Fleury's algorithm - Hamiltonian graphs - Weighted graphs.

Unit -III

Bipartite graphs - Marriage problem - Trees - Matrix representations

Unit -IV

Planar graphs - Euler formula - Platonic solids - Dual of a plane graph - Characterization of planar graphs.

Unit -V

Vertex colouring - Edge colouring - An algorithm for vertex colouring – Directed graphs.

Book for study:

S. A. Choudum, A First course in Graph Theory, Macmillan Publishers India Pvt Ltd, 2011

Chapters:

Unit-I: Chapter 1: Section 1.1 – 1.7

Unit-II: Chapter 2: Section 2.1 – 2.4

Unit-III: Chapter 3: Section 3.1 – 3.3 & Chapter 4: Section 4.1

Unit-IV: Chapter 5: Section 5.1 – 5.5

Unit-V: Chapter 6 – 6.1- 6.3 & Chapter 7 – 7.1

Books for Reference:

1. F. Harary, Graph Theory, Narosa Publishing Company, 2001.
2. Narsingh Deo, Graph Theory with applications to Engineering & Computer Science, Prentice Hall of India ,New Delhi, 1997.

Web Resources/E Books:

1. https://d3gt.com/ - Learn Graph Theory Interactively
2. https://www.mathsisfun.com/graph/index.html
3. https://brilliant.org/courses/graph-theory-intro/
4. http://mathworld.wolfram.com/GraphTheory.html
5. https://www.javatpoint.com/graph-theory - Graph Theory Tutorial

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill:

- Knowledge to find the connectivity of graphs, Euler tours and Hamilton cycles, Directed paths and Cycles Network Problems
- Enhance the problem solving ability related to matrix representation and vertex colouring of Graphs

Activities to be given: Work in Graphs to classify different Graphs and provide justification for your classification and discuss an algorithm for vertex colouring

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Be able to define and classify graphs based on various parameters such as degree, isolated pendent vertices, and isomorphisms.	Up to K4
CO2	Be able to identify and explain the properties of trees, including pendent vertices, distances and centres, Eulerian and Hamiltonian Graphs.	Up to K4
CO3	Be able to demonstrate an understanding of the Bipartite graphs and Trees.	Up to K4
CO4	Be able to explain the concepts of planar graph, and their applications	Up to K5
CO5	Be able to use vertex coloring of a graph and to solve problems related to Directed graphs.	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	1	1	3	3
CLO2	3	3	2	2	1	3
CLO3	3	3	2	2	2	3
CLO4	3	2	2	2	1	3
CLO5	3	3	2	2	3	3

1.Basic level **2. Intermediate level** **3. Advanced level**

Annexure -5

Lesson plan:

Unit	Description	Hours	Mode
I	Graphs - Pictorial representation- Subgraphs - Isomorphism and degrees - Walks and connected graphs - Cycles in graphs - Cut vertices and cut edges.	**15**	Chalk and Talk
II	Eluerain graphs - Fleury's algorithm - Hamiltonian graphs - Weighted graphs.	**15**	Chalk and Talk
III	Bipartite graphs - Marriage problem - Trees -. Matrix representations.	**15**	Chalk and Talk
IV	Planar graphs - Euler formula - Platonic solids - Dual of a plane graph - Characterization of planar graphs.	**15**	Chalk and Talk
V	Vertex Coloring - Edge coloring - An algorithm for vertex coloring – Directed graphs	**15**	Chalk and Talk
		Total	**75**

Annexure -5

Department of Mathematics						III B.Sc.		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**SE**	**Total**
V	Core Elective	23OUMADSE5D	Number Theory And Cryptography	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives:

- Learn basic number theory concepts and proof techniques like induction and divisibility.
- Understand prime numbers, factorization, and related theorems.
- Solve congruences and apply the Chinese Remainder and Fermat's theorems.
- Study arithmetic functions and quadratic residues.
- Explore applications of number theory in cryptography.

Course Content:

Unit - I

Introduction –Conjectures - Well Ordering and Induction – Sigma notation and product notation - Binomial Coefficients – Greatest Integer functions – Divisibility – Greatest Common Divisor (GCD) – Euclid Algorithm.

Unit – II

Introduction – primes counting function – prime number theorem –canonical factorization – fundamental theorem of arithmetic – Seive of Eratosthenes – Determining factorization

Unit – III

Congruence – equivalence relations- linear congruences – linear Diophantine equations and Chinese remainder theorem – Polynomial Congruences – modular arithmetic and Fermat's theorem – Wilson's theorem and Fermat number

Unit – IV

Arithmetic functions – Sigma function - tau functions –Dirichlet product – quadratic reisdues and Legendre symbols .

Unit - V

Cryptography: Introduction – Character Ciphers – Block Ciphers – One time Pods – Public – Key Cryptography

Book for study:

Neville Robbins; *Beginning Number Theory*, Second Edition, Narosa, 2006

Chapters:

Unit I: Chapter 1,2

Unit II : Chapter 3

Unit III: Chapter 4

Unit IV: Chapter 5,7

Unit V: Chapter 12

Books for Reference:

1. Tom Apostol, Introduction to Analytic Number theory, Narosa Publications, New Delhi
2. Neal Koblitz, A Course in Number Theory and Cryptography, Springer-Verlag, New York,1987.
3. David M.Burton, Elementary Number Theory, Wm.C.Brown Publishers, Dubuque, Iowa, 1989.

Web Resources/E Books:

1. http://mathforum.org,
2. http://ocw.mit.edu/ocwweb/Mathematics,
3. http://www.opensource.org,
4. https://onlinecourses.nptel.ac.in/noc20_ma42/preview

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill:

Gain deep knowledge of number theory concepts including divisibility, primes, congruences, and arithmetic functions.
Develop skills to solve Diophantine equations, apply modular arithmetic, and understand cryptographic techniques for secure communication.

Activities to be given:

We will be providing students with intellectual problems, theory application problems, group discussion and other practical works and also insist them to check the books for references and web resources

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Understand the properties of divisibility and congruence	Up to K4
CO2	Use arithmetic functions in area of mathematics	Up to K4
CO3	Understand and use the theorems , Chinese reminder theorem and Lagrange's theorem	Up to K4
CO4	Know the applications of reciprocity law and Diophantine equation	Up to K5
CO5	Apply elementary number theory concepts in cryptography.	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	1	1	3	3
CLO2	3	3	2	2	1	3
CLO3	3	3	2	2	2	3
CLO4	3	2	2	2	1	3
CLO5	3	3	2	2	1	3

1. Basic level 2. Intermediate level 3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	Introduction –Conjectures - Well Ordering and Induction – Sigma notation and product notation - Binomial Coefficients – Greatest Integer functions – Divisibility – Greatest Common Divisor (GCD) – Euclid Algorithm.	**12**	Chalk and Talk
II	Introduction – primes counting function – prime number theorem –canonical factorization – fundamental theorem of arithmetic – Seive of Eratosthenes – Determining factorization	**12**	Chalk and Talk
III	Congruence – equivalence relations- linear congruences – linear Diophantine equations and Chinese remainder theorem – Polynomial Congruences – modular arithmetic and Fermat's theorem – Wilson's theorem and Fermat number	**12**	Chalk and Talk
IV	Arithmetic functions – Sigma function - tau functions –Dirichlet product – quadratic residues and Legendre symbols .	**12**	Chalk and Talk
V	Cryptography: Introduction – Character Ciphers – Block Ciphers – One time Pods – Public – Key Cryptography	**12**	Chalk and Talk
		Total	**60 hrs**

Department of Mathematics						III B.Sc.		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**SE**	**Total**
VI	Core	23OUMA61	Linear Algebra	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives:

- To understand the concept of vector spaces.
- To analyze bases and dimensions
- To explore the applications of linear transformation
- To determine the eigen values and eigen vectors and diagonalization
- To Understand inner products and norms

Course Content:

UNIT- I: Vector spaces – Subspaces – Linear Combinations and Systems of Linear equations

UNIT- II: Linear Dependence and Linear independence – Bases and Dimension

UNIT-III: Linear transformations, null spaces and ranges – Matrix representation of a linear transformation –invertibility and isomorphisms

UNIT – IV Eigen values and eigen vectors-Diagonalizability – Invariant subspaces and Cayley–Hamilton theorem

UNIT-V : Inner products and norms –The Gram Schmidt Orthogonalization Process and Orthogonal complement

Annexure -5

Book for study:

Linear Algebra - Stephen H Friedberg, Arnold J Insel and Lawrence E Spence, 5 th edition (2018) Pearson

Chapters:

UNIT-I Chapter 1 Section:1.2 to 1.4
UNIT-II Chapter 1 Section:1.5 and 1.6
UNIT-III Chapter 2 Section:2.1,2.2 and 2.4
UNIT-IV Chapter 5 Section:5.1,5.2 and 5.4
UNIT-V Chapter 6 Section: 6.1 and 6.2

Books for Reference:

1. I.N.Herstein, Topics in Algebra, Wiley Eastern Ltd. Second Edition, 2006.
2. S. Lang, Introduction to Linear Algebra, 2nd Ed., Springer, 2005
3. N.S.Gopalakrishnan, University Algebra, New Age International Publications, Wiley Eastern Ltd.

Web Resources/E Books:

https://rksmvv.ac.in/wp-content/uploads/2021/04/Gilbert_Strang_Linear_Algebra_and_Its_Applicatio_230928_225121.pdf
https://math.emory.edu/~lchen41/teaching/2020_Fall/Nicholson-OpenLAWA-2019A.pdf

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill:

Build a solid understanding of vector spaces, linear transformations, eigenvalues, and inner product spaces.
Develop skills to analyze linear systems, perform matrix operations, and apply orthogonalization techniques for problem-solving

Annexure -5

Activities to be given:

We will be providing students with intellectual problems, group discussion and also insists them to check reference books and web resources.

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Acquire a detailed knowledge about vector spaces and subspaces	Up to K4
CO2	Explain the concepts of Linear Dependence, Linear Independence, Bases and Dimension of basis	Up to K4
CO3	Explain the concept of Linear Transformations, their Matrix representation and the notion of dual spaces	Up to K4
CO4	Find the Eigen values and Eigen vectors, to apply the concepts for diagonalisation	Up to K5
CO5	Explain about Inner product and norms and to apply Gram Schmidt Orthogonalization Process to problems on inner product spaces	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Annexure -5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	2	3	-	-
CLO2	3	3	3	3	-	-
CLO3	3	3	2	3	1	-
CLO4	3	3	3	3	-	-
CLO5	3	3	3	3	1	-

2. Basic level 2. Intermediate level 3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	Vector spaces – Subspaces – Linear Combinations and linear span - Systems of Linear equations – Homogenous Equations – Non-homogenous Equations – Elementary Matrices – Row reduced -Echelon form	**18**	Chalk and Talk
II	Linear Dependence and Linear independence – Bases – Dimensions	**18**	Chalk and Talk
III	Linear transformations, null spaces and ranges – Matrix representation of a linear transformation –invertibility and isomorphisms	**18**	Chalk and Talk
IV	Taylor's series-Laurent's series-Zeros of an analytic function-Singularities	**18**	Chalk and Talk
V	Inner products and norms – Gram Schmidt Orthogonalization Process - Orthogonal complements	**18**	Chalk and Talk, Seminar
	Total **90**		

Annexure -5

Department of Mathematics						III B.Sc.		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**SE**	**Total**
VI	**Core**	23OUMA62	Complex Analysis	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	Entrepreneurship oriented

Course Objectives:

1. Understand limits, continuity, and analyticity of complex functions.
2. Apply bilinear transformations and analyze fixed points.
3. Perform complex integration using Cauchy's theorems.
4. Use Taylor and Laurent series to study singularities and zeros.
5. Evaluate integrals using residues and Cauchy's Residue Theorem

Course Content:

UNIT- I: Analytic functions: Functions of a complex variable – Limits –Theorem on limits – Continuous functions- Differentiability- The Cauchy Riemann equations-Analytic function-Harmonic functions -Conformal mapping.

UNIT- II: Bilinear Transformation: Elementary Transformations- Bilinear Transformation-Cross Ratio-Fixed points of Bilinear transformation.

UNIT-III: Complex Integration: Definite integral-Cauchy's theorem-Cauchy's integral formula-Higher derivatives.

UNIT – IV: Series expansion-Taylor's series-Laurent's series-Zeros of an analytic function-Singularities.

UNIT-V: Calculus of Residues: Residues-Cauchy's Residue Theorem

Annexure -5

Book for study:

Dr. S. Arumugam, Prof. A. Thangapandi Isaac and Dr. A. Somasundaram, *Complex Analysis*, SciTech Publication, India Private Ltd., January 2018.

Chapters:

UNIT-I Chapter 2 Section:2.1 to 2.9
UNIT-II Chapter 3 Section:3.1 to 3.4
UNIT-III Chapter 6 Section:6.1 to 6.4
UNIT-IV Chapter 7 Section:7.1 to 7.4
UNIT-V Chapter 8 Section: 8.1 & 8.2

Books for Reference:

2. P. Durai Pandian and Others, Complex Analysis, S. Chand Publishing Company, 2014.
3. Dr. R. Roopkumar, Complex Analysis, Pearson Education India, 2014.
4. T. K. M. Pillai, Dr. S. P. Rajagopalan and Dr. R. Sattanathan, Complex Analysis, S. Vishwanathan Private Ltd., 200

Web Resources/E Books:

https://nptel.ac.in

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill: Develop a strong understanding of complex function theory, including analyticity, bilinear transformations, and complex integration techniques.Gain skills to apply series expansions and residue calculus for solving complex variable problems and evaluating integrals.

Activities to be given:

We will be providing students with intellectual problems, group discussion and also insists them to check reference books and web resources

Annexure -5

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Explain about analytic functions, their differentiation and continuity and to verify the Cauchy Riemann equation.	Up to K4
CO2	Explain the concept of mappings by linear transformations and linear fractional transformations	Up to K4
CO3	Explain about the integrations of functions over simply and multiply connected domains and to derive the Cauchy integral formula, Cauchy Theorem	Up to K4
CO4	Find the convergence the sequences and series, to derive Taylor's and Laurent's series	Up to K5
CO5	Find the nature of Residues Theorem	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	3	2	1	-
CLO2	3	3	3	2	1	-
CLO3	3	3	3	2	1	-
CLO4	3	3	3	2	1	-
CLO5	3	3	3	2	1	-

1.Basic level 2. Intermediate level 3. Advanced level

Annexure -5

Lesson plan:

Unit	Description	Hours	Mode
I	Functions of a Complex variable – Limits –Theorem on limits – Continuous functions- Differentiablity- The Cauchy Riemann equations-Analytic function-Harmonic functions	**18**	Chalk and Talk,Group Discussion
II	Elementary transformations- Bilinear Transformation-Crossratio-Fixed points of bilinear transformation.	**18**	Lecture,Group Discussion,Problem Solving
III	Definite integral-Cauchy's theorem-Cauchy's integral formula-Higher derivatives.	**18**	Lecture,Seminar,Quiz
IV	Taylor's series-Laurent's series-Zeros of an analytic function-Singularities.	**18**	Lecture,Quiz
V	Residues-Calculus-Residue Theorem.	**18**	Chalk and Talk,Lecture,Problem Solving
	Total	**90**	

Annexure -5

Department of Mathematics						III B.Sc.		
Sem.	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**SE**	**Total**
VI	Core	23OUMA63	Mechanics	4	6	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives:

- Knowledge about Newton's laws of motion.
- Knowledge about Moment of a Force and General motion of a body .
- Skills in evaluating Work, Energy and Power.
- The ability to analyse the Projectile projected on an inclined plane.
- Utilize Conic as a centered orbit.

Course Content:

UNIT- I: Force: Newton's laws of motion – Resultant of two forces on a particle - Equilibrium of a Particle: Equilibrium of a particle – Limiting equilibrium of a particle on an inclined plane.

UNIT- II: Forces on a Rigid Body: Moment of a Force – General motion of a body – Equivalent systems of forces- Parallel Forces – Forces acting along a Triangle - A specific reduction of Forces: Reduction of coplanar forces into a force and couple – Problems involving frictional forces.

UNIT- III: Work, Energy and Power: Work – Conservative field of force – Power - Rectilinear Motion under Varying Force: Simple Harmonic Motion - along a horizontal line – along a vertical line.

UNIT -IV: Projectiles: Forces on a projectile – Projectile projected on an inclined plane

UNIT –V: Central Orbits**:** General orbits – Central orbit – Conic as a centered orbit

Book for study:

Mechanics-P.Duraipandian, Lakmi Duraipandian and Muthamizh Jayapragasam,, S.Chand and co.Private limited -Reprint 2016

Chapters:

UNIT I: Chapter 2: section 2.1 to 2.2

Chapter 3: section 3.1 to 3.2

UNIT II: Chapter 4: sections 4.1 to 4.4, 4.6 & Chapter 5 :sections 5.1 to 5.2

UNIT III: Chapter 11 :Sections 11.1,11.2 & Chapter 12 :sections 12.1 to 12.3

UNIT IV: Chapter 13 :Sections 13.1,13.2

UNIT V: Chapter 16 :sections 16.1 to 16.3

Books for Reference:

1.J.L.Meriam and L.G.Kraige, Engineering Mechanics: Statics, Seventh Edition, Wiley and sons Pvt ltd., New York, 2012.
2. J.L.Meriam and L.G.Kraige, and L.N. Bolton, Engineering Mechanics: Dynamics, 8th edn, Wiley and sons Pvt ltd., New York, 2015.
3.A.K.Dhiman, P.Dhinam and D.Kulshreshtha, Engineering Mechanics (statics and Dynamics), McGraw Hill Education(India) Private Limited, New Delhi, 2015.

Web Resources/E Books:

https://nptel.ac.in
https://www.acmtagra.com/pdf/UP/Books/Applied%20Mechanics.pdf
https://mrcet.com/downloads/digital_notes/ME/II%20year/Engineering%20Mechanics.pdf

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill:

1. In Mechanics understanding the moment of a force involves recognizing its turning effect and calculating it based on force and distance.
2. Ability to design and develop mechanical systems and strain.

Activities to be given:

Perform hands-on exercises where you calculate the Moment of a Force and General motion of a body and Work, Energy and Power. Present your results and explain their physical interpretations.

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Define Resultant, Component of a Force, Coplanar forces, like and unlike parallel forces, Equilibrium of a Particle, Limiting equilibrium of a particle on an inclined plane.	Up to K4
CO2	Define Moment of a force and Couple with examples. Define Parallel Forces and Forces acting along a Triangle, Solve problems on frictional forces	Up to K4
CO3	Define work, energy, power, rectilinear motions under varying forces. Define Simple Harmonic Motion and find its Geometrical representation.	Up to K4

CO4	Define Projectile, impulse, impact and laws of impact. Prove that the path of a projectile is a parabola. Find the direct and oblique impact of smooth elastic spheres	Up to K5
CO5	Define central orbits, explain conic as centered orbits and solve problems related to central orbits	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CLO1	1	2	3	4	5	6
CLO2	3	2	3	1	-	-
CLO3	3	2	3	1	2	-
CLO4	3	3	3	3	-	-
CLO5	3	3	3	3	-	-

1. Basic level 2. Intermediate level 3. Advanced level

Annexure -5

Lesson plan:

Unit	Description	Hours	Mode
I	Force: Newton's laws of motion – Resultant of two forces on a particle - Equilibrium of a Particle: Equilibrium of a particle – Limiting equilibrium of a particle on an inclined plane.	18	Chalk and Talk ,PPT
II	Forces on a Rigid Body: Moment of a Force – General motion of a body – Equivalent systems of forces- Parallel Forces – Forces acting along a Triangle - A specific reduction of Forces: Reduction of coplanar forces into a force and couple – Problems involving frictional forces.	18	Chalk and Talk ,PPT
III	Work, Energy and Power: Work – Conservative field of force – Power - Rectilinear Motion under Varying Force: Simple Harmonic Motion - along a horizontal line – along a vertical line.	18	Chalk and Talk ,PPT
IV	Projectiles: Forces on a projectile – Projectile projected on an inclined plane	18	Chalk and Talk ,PPT
V	Central Orbits**:** General orbits – Central orbit – Conic as a centered orbit	18	Chalk and Talk ,PPT
Total		**90 hours**	

Annexure -5

Department of Mathematics						III B.Sc.		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/ week**	**CIA**	**SE**	**Total**
VI	Core-Elective	23OUMADSE6A	Programming in C++	2	3	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	Entrepreneurship oriented

Course Objectives:

- To understand about object-oriented languages and their applications
- To introduce basic concepts of C++language
- To provide knowledge about various conversions
- To enlighten the various inheritance system
- To impart knowledge on files and exception handling

Course Content:

UNIT I

Introduction to C++; Tokens, Keywords, Identifiers and Constants, Basic Data types, User-Defined Data types, Derived Data types Operators in C++,.Manipulators, Expressions and their types , Operator overloading , Control Structures in C++;Simple C++ Programs.

UNIT II

Functions in C++ : Introduction ,The Main Function - Function Prototyping –Call by Reference Return by Reference- – Inline Functions – Default Arguments – Const Arguments Function Overloading Friend and Virtual Functions –Math Library functions

UNIT III

Classes and Objects: Introduction- C Structure Revised- Specifying a Class= Defining Member Functions- A C++ Program with Class- Making an Out side Function Inline-Nesting of Member Functions- Private Member Function - Array with in a Class – Memory Allocations for Objects- Static Data Members –Static Member Functions Arrays of Objects as Function Arguments – Friendly Functions – Returning Objects– **Constructors and Destructors;** Introduction – Constructors – Parametrized Constructors- Multiple Constructors with Default Arguments- Dynamic Initialization of Objects- Copy Constructor- Dynamic Constructors- Constructing Two- dimensional Arrays- const Objects- Destructors **Operator Overloading and Type Conversions:** Introduction – Defining Operator Overloading- Overloading Unary Operators- Overloading Binary Operators- Overloading Binary Operators Using Friends- Manipulation of Strings Using Operators- Rules for Overloading Operators- Type Conversions

UNIT IV

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 –Abstruct Classes, **Pointers, Virtual Functions and Polymorphism**; Introduction- Pointers- Pointers to Objects- this Pointer – Pointers to Derived Classes- Virtual Functions – Pure Virtual 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 V

Working with Files: Classes for File Stream Operations -Opening and Closing a File – Detecting end of –File- More About Open (); File Models- File Pointers and their Manipulations –Sequential Input and Output Operators- Updating a File: Random Access- Error Handling During File Operations – Command Line Arguments Updating a File - Error Handling during File Operations - Command-line Arguments.

Book for study:

E. Balagurusamy, 2008, Object Oriented Programming with C++, Tata McGraw-Hill

Publishing Company Ltd

.**Chapters:**

Unit I :	Chapter 3.1 to 3.7,3.13,3.17,3.19,3.22,3.24
Unit II:	Chapter 4.1 to 4.11
Unit III:	Chapter 5.1 to 5.16
	Chapter 6, 6.1 to 6.11 and
	Chapter.7, 7.1 to 7.8
Unit IV:	Chapter 8, 8.1 to 8.10
	Chapter 9 9.1 to 9.7
	Chapter 10 10.1 to 10.6
Unit V :	Chapter 11.11.1 to 11.10,

Books for Reference:

1 Robert Lafore, Object Oriented Programming in Microsoft C++, Galgotia publication

2 Byron S.Gottfried, Schaum's Outline of programming with C++ 2nd Edition

3 "Let us C++" – YeswantKanetkar – BPB Publications, 1999

Web Resources/E Books:

1 http://cppannotations.sourceforge.net/

2 https://www.cplusplus.com/doc/tutorial/

3 https://www.programiz.com/cpp-programming

4 https://www.w3schools.com/cpp/default.asp -

Annexure -5

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill: Gain solid knowledge of C++ programming fundamentals, including data types, functions, classes, inheritance, and file handling.
Develop practical skills to write, debug, and manage efficient C++ programs using object-oriented concepts and file operations.

Activities to be given:

We will be providing students with intellectual programme , group discussion and also insists them to check reference books and web resources.

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Recalling various concepts relating to languages and applications	Up to K4
CO2	Understanding various functions of C++ language	Up to K4
CO3	Applying various classes and objects	Up to K4
CO4	Analyzing different types of inheritance system	Up to K5
CO5	Understanding working bout files and exception handling	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	3	2	1	-
CLO2	3	3	3	2	1	-
CLO3	3	3	3	2	1	-
CLO4	3	3	3	2	1	-
CLO5	3	3	3	2	1	-

1. Basic level 2. Intermediate level 3. Advanced level

Annexure -5

Lesson plan:

Unit	Description	Hours	Mode
I	Introduction to C++; Tokens, Keywords, Identifiers, Variables, Operators, Manipulators, Data types -Expressions and Control Structures in C++; Simple C++ Programs	**12**	Chalk and Talk Group Discussion
II	Functions in C++ - Main Function - Function Prototyping -Parameters Passing in Functions - Values Return by Functions – Inline Functions - Friend and Virtual Functions –Math Library functions	**12**	Lecture, Group Discussion
III	Classes and Objects; Constructors and Destructors; Operator Overloading and Type Conversions - Type of Constructors – Function Definition - Function overloading – Function Overriding.	**12**	Lecture, Seminar, Quiz
IV	Inheritance: Single Inheritance - Multilevel Inheritance - Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance - Pointers, Virtual Functions and Polymorphism; Managing Console I/O operations.	**12**	Lecture, Quiz
V	Working with Files: Classes for File Stream Operations -Opening and Closing a File – Endof -File Deduction - File Pointers - Updating a File - Error Handling during File Operations - Command-line Arguments.	**12**	Chalk and Talk Lecture
	Total	**60 Hrs**	

Annexure -5

Department of Mathematics						III B.Sc.		
Sem	Category	Course Code	Course Title	Credit	Contact Hours/ week	CIA	SE	Total
VI	Core-Elective Practical	23OUMADSE6AP	Programming in C++ - Practical	1	2	40	60	100

PROGRAMMING IN C++ PRACTICAL:

1. Write a Program to illustrate New and Delete Keywords for dynamic memory allocation

2. Write a program Illustrating Class Declarations, Definition, and Accessing Class Members.

3. Program to illustrate default constructor, parameterized constructor and copy constructors

4. Write a Program to Demonstrate the i) Operator Overloading. ii) Function Overloading.

5. Write a Program to Demonstrate Friend Function and Friend Class.

6. Write a Program to Access Members of a STUDENT Class Using Pointer to Object Members.

7. Write a Program to Generate Fibonacci Series use Constructor to Initialize the Data Members.

8. Write a C++ program to implement the matrix ADT using a class. The operations supported by this ADT are: a) Reading a matrix. b) Addition of matrices. c) Printing a matrix. d) Subtraction of matrices. e) Multiplication of matrices

9. Write C++ programs that illustrate how the following forms of inheritance are supported: a) Single inheritance b) Multiple inheritance c) Multi level inheritance d) Hierarchical inheritance

10. Write a C++ program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class.

Annexure -5

Department of Mathematics						III B.Sc.		
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
VI	Core-Elective	23OUMADSE6B	Programming in Java	2	3	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	Entrepreneurship oriented

Course Objectives:

- Understand Java syntax and basic programming constructs.
- Apply object-oriented concepts using classes and inheritance.
- Implement exception handling and multithreading.
- Perform file operations and object serialization.
- Develop simple GUI applications using AWT and Swing.

Course Content:

Unit I: Fundamentals of Java Programming:This unit covers the history and features of Java, components of Java (JVM, JRE, JDK), syntax and structure of Java programs, primitive data types, variables, expressions, and control flow statements such as if, switch, loops, and the usage of the Scanner class for input.

Unit II: Classes, Objects, and Constructors

This unit introduces classes, objects, constructors, and method overloading. It explains static members, the use of 'this' and 'super' keywords, and access control specifiers within Java programs.

Unit III: Inheritance and Interfaces

This unit explains different types of inheritance, method overriding, abstract classes, and interfaces. It emphasizes polymorphism and the concept of reusable code. Package creation and usage of the import keyword are also included.

Unit IV: Exception Handling and Multithreading

The unit focuses on the concept of exceptions, built-in and user-defined exceptions, try-catch-finally constructs, and the throw and throws keywords. It further includes the creation and management of threads, thread life cycle, and synchronization mechanisms.

Unit V: File Handling and GUI

This unit covers file input/output operations using classes like FileReader, FileWriter, and BufferedReader. It explains object serialization. It introduces basic AWT and Swing components including labels, buttons, and text fields. It also explains layout managers and the event-handling model.

Book for Study:

E. Balagurusamy, Programming with Java, McGraw Hill, Latest Edition.

Books for Reference:

1. Herbert Schildt, Java: The Complete Reference, McGraw Hill.
2. Kathy Sierra & Bert Bates, Head First Java, O'Reilly.

Web Resources / E-books:

1. https://docs.oracle.com/javase/
2. https://www.javatpoint.com/java-tutorial\
3. https://www.w3schools.com/java/

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

The course develops a sound theoretical foundation in Java with strong practical programming skills. Students acquire the ability to solve real-world problems using object-oriented design and Java-based development.

Knowledge and Skill:

Students will complete programming assignments, participate in lab sessions, debug code, and submit a mini project based on real-time application development using Java.

Activities to be given:

Students will complete programming assignments, participate in lab sessions, debug code, and submit a mini project based on real-time application development using Java.

Annexure -5

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy(Up to Levels)
CO1	Understand and apply Java syntax, control structures, and operators.	Up to K3
CO2	Design and implement classes, constructors, and inheritance models.	Up to K4
CO3	Handle runtime exceptions and create multithreaded applications.	Up to K4
CO4	Read and write data to files and develop graphical user interfaces using AWT/Swing.	Up to K5
CO5	Build and test Java programs for solving practical and business-related problems.	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	1	2	-		-	-
CLO2	1	1	-	2	-	-
CLO3	2	2	-		-	-
CLO4	3	3	-	3	-	-
CLO5	3	3	-	3	-	-

2. Basic level 2. Intermediate level 3. Advanced level

Annexure -5

Lesson plan:

Unit	Description	Hours	Mode
I	focuses on syntax and control structures, with exercises in writing and testing basic programs.	**12**	
II	explores class structures, constructors, and object-oriented design with coding activities.	**12**	
III	elaborates on inheritance and interfaces through real-time coding problems.	**12**	
IV	includes exception and thread handling with interactive examples and student practice.	**12**	
V	implements file input/output and GUI design through component-based programming and small projects.	**12**	
Total		**60**	

Annexure -5

Department of Mathematics						III B.Sc.		
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
VI	Core-Elective Practical	23OUMADSE6BP	Programming in Java	1	2	40	60	100

PROGRAMMING IN PYTHON – PRACTICAL

1. Write a program to demonstrate the use of if-else and switch statements.
2. Implement loop constructs such as for, while, and do-while.
3. Create a class with a constructor and display the initialized values.
4. Demonstrate method overloading using multiple methods in a class.
5. Create a class hierarchy to demonstrate single and multilevel inheritance.
6. Write a program to show method overriding and dynamic dispatch.
7. Develop a program using abstract class and interface.
8. Implement try-catch blocks to handle exceptions.
9. Write a program to define and throw a user-defined exception.
10. Create and start multiple threads using Thread and Runnable.

Annexure -5

Department of Mathematics						III B.Sc.		
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
VI	Core-Elective	23OUMADSE6C	Numerical Methods	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives:

- To Solve Algebraic and Transcendental Equations Using Iterative and Root-finding Methods.
- To Explore Finite Differences and Interpolation Techniques for Data Approximation.
- To Apply Numerical Differentiation and Integration Methods for Function Analysis.
- Master Numerical Solutions of Ordinary Differential Equations using Iterative Techniques.
- To Understand the principles of accuracy and convergence in numerical methods.

Course Content:

UNIT I: Algebraic and Transcendental Equations - Introduction - Iteration Method - Bisection Method – Regula Falsi method -- Newton- Raphson Method. Simultaneous Equations – Back substitution - Gauss Elimination Method – Gauss Jordan Elimination Method – Iterative methods (Gauss Jacobi Iteration Method)– Gauss-Seidal Iteration Method.

UNIT II : Finite Differences –Difference operators - Other Difference operators.

UNIT III : Interpolation - Newton's Interpolation Formula - Lagrange's Interpolation formula - Divided Differences - Newton's Divided differences formula – Inverse Interpolation.

UNIT IV : Numerical Differentiation and Integration – Derivatives using Newton's forward difference formula – Derivatives using Newton's backward difference formula - Derivatives using central difference formula – Maxima and minima of the interpolating polynomial – Numerical integration – Newton-Cote's quadrature formula - Trapezoidal rule - Simpson's one third rule - Simpson's three eight rule.

UNIT V : Numerical Solutions of Ordinary Differential Equations – Taylor's Series Method – Picard's Method - Euler's Method – Runge-Kutta Methods.

Book for study:

S. Arumugam, A.Thangapandi Isaac and A.Somasundaram. Numerical Methods, Second Edition, Scitech Publications (India) Pvt. Ltd (2015).

Chapters:

UNIT I Chapter 3: Sections (3.2 to 3.5)
Chapter 4: Sections (4.1 to 4.4 & 4.7, 4.8)
UNIT II Chapter 6: Sections (6.1 &6.2)

UNIT III Chapter 7: Sections (7.1 & 7.3 to 7.6)

UNIT IV Chapter 8: Sections (8.1 to 8.5)
UNIT V Chapter10: Sections (10.1 to 10.4)
(**All Units Problems only**)

Books for Reference:

1. Kandasamy.P., Thilagavathy.K,K.Gunavathy *Numerical Methods*, Second Edition, Sultan Chand & Company Ltd,2003.
2. Sastry. S.S. *Introductory methods of Numerical Analysis*.Prentice Hall of Pvt., Ltd.,1988.
3. Venkataraman. M.K., *Numerical methods in Science and Engineering* National Publishing Company,2000.

Web Resources/E Books:

1. **https://gdcboysang.ac.in/About/Droid/uploads/Numerical%20Methods.pdf**
2. **https://www.math.iitb.ac.in/~siva/si50716/SI507lecturenotes.pdf**
3. **https://www.lkouniv.ac.in/site/writereaddata/siteContent/20200403225057 1912siddhart h_bhatt_engg_Numerical_Differentation_and_Integration.pdf**

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill:

Iterative methods, root-finding algorithms, finite differences, interpolation, numerical differentiation, integration, differential equations.
Numerical approximation, differential equation solving.

Activities to be given: We will be providing students with intellectual problems, group discussion and also insists them to check reference books and web resources.

Annexure -5

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Solve algebraic and transcendental equations using bisection method, iteration method, regula falsi method, and Newton Raphson method	Up to K4
CO2	Solve simultaneous linear equations using Gauss elimination method, Gauss Jordon method, and Gauss Seidel method	Up to K4
CO3	Use finite differences to calculate differences of a polynomial, factorial polynomials, differences of zero, and summation series.	Up to K4
CO4	Perform interpolation using central differences formulae, and Gauss forward and backward formulae.	Up to K5
CO5	Perform Numerical differentiation and integration.	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	3	2	1	-
CLO2	3	3	3	2	1	-
CLO3	3	3	3	2	1	-
CLO4	3	3	3	2	1	-
CLO5	3	2	2	3	1	-

1. Basic level 2. Intermediate level 3. Advanced level

Annexure -5

Lesson plan:

Unit	Description	Hours	Mode
I	Algebraic and Transcendental Equations - Introduction - Iteration Method - Bisection Method – Regula Falsi method -- Newton- Raphson Method. Simultaneous Equations – Simultaneous Equations - Back substitution - Gauss Elimination Method – Gauss Jordan Elimination Method – Iterative methods (Gauss Jacobi Iteration Method)– Gauss- Seidal Iteration Method.	**15**	Chalk and Talk
II	Finite Differences –Difference operators - Other Difference operators.	**15**	Lecture , Group Discussion
III	Interpolation - Newton's Interpolation Formula - Lagrange's Interpolation formula - Divided Differences - Newton's Divided differences formula – Inverse Interpolation.	**15**	Lecture ,Chalk and Talk, Quiz
IV	Numerical Differentiation and Integration – Derivatives using Newton's forward difference formula – Derivatives using Newton's backward difference formula - Derivatives using central difference formula – Maxima and minima of the interpolating polynomial – Numerical integration – Newton-Cote's quadrature formula - Trapezoidal rule - Simpson's one third rule - Simpson's three eight rule.	**15**	Seminar, Quiz
V	Numerical Solutions of Ordinary Differential Equations – Taylor's Series Method – Picard's Method - Euler's Method – Runge-Kutta Methods.	**15**	Chalk and Talk. Seminar Quiz
	Total **75 Hrs**		

Annexure -5

Department of Mathematics						III B.Sc.		
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
VI	Core Elective	23OUMADSE6D	Discrete Mathematics	3	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives:

- Learn the principles of propositional and predicate logic for formal reasoning.
- Apply rules of inference and proof techniques in logical systems.
- Understand lattice theory and Boolean algebra for logic circuit design.
- Use combinatorial methods to solve counting and arrangement problems.
- Study formal languages and finite automata for language recognition and computation.

Course Content:

Unit -I

Propositional Logic

Propositional Logic: Definition, Connectives, Statements &Notation, Truth Values, Tautology and contradiction, Statement Formulas & Truth Tables, Well-formed Formulas, Equivalence of

Formulas, Duality Law, Tautological Implications, normal forms Examples

Unit -II

Predicate Logic

Theory of inference, Truth table technique, Rules of inference, Indirect method of proof, Predicate Logic: Definition of Predicates; Statement functions, Variables, Quantifiers, Predicate Formulas, Free & Bound Variables; Valid Formulas & Equivalences, The Universe of Discourse - Examples.

Unit -III

Lattices & Boolean Algebra

Lattices – Properties of lattices – Lattice as Algebraic System-Sub lattices- lattice Homomorphism-Special Lattices – Boolean Algebra- sub algebra- Boolean Expression and Boolean functions-expression of a Boolean function in canonical form logic Gates- Karnaugh Map Method

Unit -IV

Combinatorics

Permutations and Combinations, Pascal's identity, Permutation with repetition, The Pigeonhole Principle, Generalisation of Pigeonhole principle, Principles of Inclusion-Exclusion Principle - Examples

Unit -V

Formal languages

Introduction- Phrase –Structure Grammar- Types – BNF- Finite state Machine – Input output strings- Finite state Automata

Book for study:

Discrete mathematics – T.Veerarajan – McGraw Hill Education 2017

Chapters:

Unit I: Chapter 1 – up to page no. 26

Unit II: Chapter 1– Page no.27 to 50

Unit III: Chapter 2 – Page no. 96 to 114

Unit IV: Chapter 6 – Page no 314 to 337

Unit V: Chapter 8 – Page no. 448 to 467

Books for Reference:

1. Tremblay and Manohar – Discrete Mathematical Structures with application to Computer Science, (Tata McGraw Hill, New Delhi) 1997.
2. Venkataraman. M.K. and others – Discrete mathematics 2000 The National Publishing Company

Web Resources/E Books:

1. https://www.javatpoint.com/discrete-mathematics-tutorial - Discrete mathematics Tutorial

2. https://www.khanacademy.org/computing/computer-science/algorithms/intro-toalgorithms/v/discrete-mathematics

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill:

Acquire foundational knowledge of logic, Boolean algebra, combinatorics, and formal languages.
Develop skills to analyze logical statements, simplify Boolean expressions, solve counting problems, and model computations using automata.

Activities to be given:

We will Providing students with intellectual problems, theory application problems, group discussion and other practical works and also insist them to refer web resource and e-books.

Course Learning Outcome (CLOs)

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	able to apply the concepts of propositional Logic	Up to K4
CO2	able to analyze and interpret predicate logic	Up to K4
CO3	able to apply the concepts of Lattices & Boolean Algebra.	Up to K4
CO4	ability to solve problems in Combinatorics	Up to K5
CO5	ability to apply the concepts of formal languages	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	3	1	1	3	3
CLO2	3	3	2	2	1	3
CLO3	3	3	2	2	2	3
CLO4	3	2	2	2	1	3
CLO5	3	3	2	2	3	3

1.Basic level 2. Intermediate level 3. Advanced level

Annexure -5

Lesson plan:

Unit	Description	Hours	Mode
I	Propositional Logic: Definition, Connectives, Statements &Notation, Trut Values, Tautology and contradiction, Statement Formulas & Truth Tables, Wel formed Formulas, Equivalence of Formulas, Duality Law, Tautological Implications, normal forms Examples	**12**	Chalk and Talk
II	Theory of inference, Truth table techniqu Rules of inference, Indirect method of proof, Predicate Logic: Definition of Predicates; Statement functions, Variable Quantifiers, Predicate Formulas, Free & Bound Variables; Valid Formulas & Equivalences, The Universe of Discourse Examples.	**12**	Chalk and Talk
III	Lattices – Properties of lattices – Lattice a Algebraic System-Sub lattices- lattice Homomorphism- Special Lattices – Boolean Algebra- sub algebra- Boolean Expression and Boolean functions- expression of a Boolean function in canonical form logic Gates- Karnaugh Map Method	**12**	Chalk and Talk
IV	Permutations and Combinations, Pascal's identity, Permutation with repetition, The Pigeonhole Principle, Generalisation of Pigeonhole principle, Principles of Inclusion-Exclusion Principle - Examples	**12**	Chalk and Talk
V	Introduction- Phrase –Structure Grammar- Types – BNF- Finite state Machine – Input output strings- Finite state Automata	**12**	Chalk and Talk
		Total	**60 hrs**

Annexure -5

Department of Mathematics						III B.Sc.		
Sem	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
VI	SEC	23OUMASEC6	Essential Reasoning and Quantitative Aptitude	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented

Course Objectives:

- Develop problem-solving skills for competitive examinations
- Understand the concepts of Roots, simple interest, compound interest, time and work,
- Apply reasoning concepts to solve problems related to competitive examinations

Course Content:

Unit - I

Quantitative Aptitude: Simplifications - short cuts– concepts – problems

– Square Roots& Cube Roots - short cuts– concepts – problems

Unit - II

Time and work - short cuts – concepts – problems, Time and Distance - short cuts – concepts – problems

Unit – III

Simple Interest - Compound interest – concepts –problems

Unit – IV

Verbal Reasoning: Coding and decoding- Blood relation -Direction sense test.

Unit – V

Verbal Reasoning: Number, Ranking &Time Sequence Test -Mathematical Operations-Arithmetical Reasoning

Book for study:

1. Quantitative Aptitude" by R.S.Aggarwal, S.Chand & Company Ltd., Ram

Nagar, New Delhi (2007)

2. A Modern Approach to Verbal & Non – Verbal Reasoning" by R.S.Aggarwal, S.Chand & Company Ltd., Ram Nagar, New Delhi (2008)

Chapters:

Book I
Unit I: Chapter 4 (Page No- 67-74) & Chapter 5 (Page No- 117-121).
Unit II: Chapter 15(Page No- 341-345) & Chapter 17 (Page No- 384-387).
Unit III: Chapter 21(Page No- 445-448) **&** Chapter 22 (Page No- 466-471).
Book II
Unit IV: Verbal Reasoning - Chapter 4(Page No- 194-196), Chapter 5(Page No- 261-263), &Chapter 8(Page No- 416-419).
Unit V: Verbal Reasoning - Chapter 12(Page No- 542-545), Chapter 13(Page No- 569-571), &Chapter 15(Page No- 601-605).

Books for Reference:

1.U. Mohan Rao, Quantitative Aptitude for Competitive Examinations, Scitech Publications, 2016.

2. Dr.M.Manoharan, Dr.C.Elango and Prof K.L.Eswaran, Business Mathematics, Palani paramount Publications, Reprint 2013

Web Resources/E Books:

https://tamilnaducareerservices.tn.gov.in/

https://www.geeksforgeeks.org/speed-time-distance-formula-and-aptitude-questions/

https://leverageedu.com/blog/time-and-work-tricks/?utm

Pedagogy:

Chalk and Talk, PPT, Group discussion, Quiz and on the spot test.

Rationale for nature of Course:

Knowledge and Skill:

Gain strong problem-solving skills in quantitative aptitude and verbal reasoning through shortcut techniques and logical analysis.
Develop the ability to apply mathematical concepts and reasoning methods effectively in competitive and real-world scenarios.

Activities to be given:

We will be providing students with intellectual problems, group discussion and also insist them to check reference books and web resources.

Course Learning Outcome (CLOs)

Annexure -5

At the end of the course, the student will be able to:

CLOs	Course Outcomes Statements	Knowledge According to Bloom's Taxonomy (Up to Levels)
CO1	Apply simplification and Square Roots& Cube Roots to solve problems in competitive examinations	Up to K4
CO2	Understand the concepts of time and work and distance	Up to K4
CO3	Understand the concepts of simple interest and compound interest	Up to K4
CO4	Understand Coding and Decoding, Blood relation in Reasoning	Up to K5
CO5	Understanding verbal reasoning	Up to K5

K1- Remembering facts with specific answers.

K2- Basic understanding of facts.

K3- Application oriented -Solving Problems.

K4- Analyzing, examining and making presentations with evidence.

K5- Evaluating, making Judgments based on criteria.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

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CLO3	3	1	1	2	3	3
CLO4	3	1	2	3	3	3
CLO5	3	1	1	2	3	3

1.Basic level 2. Intermediate level 3. Advanced level

Annexure -5

Lesson plan:

Unit	Description	Hours	Mode
I	Simplifications - short cuts– concepts – problems– Square Roots& Cube Roots - short cuts– concepts – problems	**6**	Chalk and Talk
II	Time and work - short cuts – concepts – problems, Time and Distance - short cuts – concepts – problems	**6**	Chalk and Talk
III	Simple Interest - Compound interest – concepts -problems	**6**	Chalk and Talk
IV	**Verbal Reasoning:** Coding and decoding – Blood relation - Direction sense test-	**6**	Chalk and Talk
V	**Verbal Reasoning**: Number, Ranking &Time Sequence Test -Mathematical Operations-Arithmetical Reasoning	**6**	Chalk and Talk
		Total	**30**