

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI – 625 014.

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)

Re-accredited (**3rd Cycle**) with Grade **A+** & **CGPA 3.51** by NAAC

DEPARTMENT OF MATHEMATICS



CBCS With OBE

BACHELOR OF SCIENCE

PROGRAMME CODE - M

COURSE STRUCTURE

(w.e.f. 2022 – 2023 Batch onwards)

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)****DEPARTMENT OF MATHEMATICS –UG****(With Allied Chemistry and Allied Physics)****CBCS with OBE****COURSE STRUCTURE****(w.e.f. 2022 – 2023 Batch onwards)**

Semester	Part	Sub Code	Title of the paper	Teaching hrs. (per week)	Duration of Exam (hrs.)	Marks allotted			Credits
						C.A	S.E	Total	
1	I	22OU1TA1	Tamil	6	3	25	75	100	3
	II	22OU2EN1	English	6	3	25	75	100	3
	III	22OUMA11	Core – Calculus	5	3	25	75	100	5
	III	22OUMA12	Core - Theory of Equations and Trigonometry	5	3	25	75	100	5
	III	22OUMAGECH1/ 22OUMAGEPH1	GEC– Allied Chemistry-I/ Mechanics, Properties of Matter and Sound	4	3	25	75	100	4
			GEC – Chemistry Practical-I: Salt Analysis/ Physics Practical- I	2	-	-	-	-	-
IV	22OUMAID1	IDC- Mathematics for Competitive Examinations – I	2	3	25	75	100	2	
2	I	22OU1TA2	Tamil	6	3	25	75	100	3
	II	22OU2EN2	English	6	3	25	75	100	3
	III	22OUMA21	Core – Analytical Geometry of 3 Dimension and Vector Calculus	5	3	25	75	100	5
	III	22OUMA22	Core - Differential Equations	5	3	25	75	100	5
	III	22OUMAGECH2/ 22OUMAGEPH2	GEC –Allied Chemistry-II/ Thermal Physics	4	3	25	75	100	4
		22OUMAGECH2P/ 22OUMAGEPH2P	GEC –Chemistry Practical -I : Salt Analysis / Physics Practical-I	2	3	40	60	100	1
	IV	22OUMAID2	IDC - Mathematics for Competitive Examinations –II	2	3	25	75	100	2
	I	22OU1TA3	Tamil	6	3	25	75	100	3
	II	22OU2EN3	English	6	3	25	75	100	3
	III	22OUMA31	Core – Modern Algebra	6	3	25	75	100	5
	III		DSEC-I	4	3	25	75	100	4

3		22OUMAGECH3/ 22OUMAGEPH3	GEC – Allied Chemistry-III / Electricity and Electronics	4	3	25	75	100	4
	III		GEC –Chemistry Practical-II :Volumetric Analysis/ Physics Practical-II	2	-	-	-	-	-
	IV	22OUMASE3	SEC-Application of Calculus	2	3	25	75	100	2
4	I	22OUITA4	Tamil	6	3	25	75	100	3
	II	22OU2EN4	English	6	3	25	75	100	3
	III	22OUMA41	Core – Sequences and Series	6	3	25	75	100	5
	III		DSEC-II	4	3	25	75	100	4
	III	22OUMAGECH4/ 22OUMAGEPH4	GEC- Allied Chemistry-IV/ Optics	4	3	25	75	100	4
		22OUMAGECH4P/ 22OUMAGEPH4P	GEC –Chemistry Practical- II :Volumetric Analysis / Physics Practical –II	2	3	40	60	100	1
	IV	22OUMASE4	SEC-Application of Differential Equations	2	3	25	75	100	2
5	III	22OUMA51	Core – Modern Analysis	6	3	25	75	100	6
	III	22OUMA52	Core – Statistics	6	3	25	75	100	5
	III	22OUMA53	Core – Mechanics	6	3	25	75	100	5
	III		DSEC-III	6	3	25	75	100	4
	IV	22OUMASE51	SEC-Quantitative Aptitude	2	3	25	75	100	2
	IV	22OUMASE5P	SEC- Latex Lab	2	3	40	60	100	2
	IV	22OUAECEV5	AECC-Environmental Studies	2	3	25	75	100	2
6	III	22OUMA61	Core –Complex Analysis	6	3	25	75	100	6
	III	22OUMA62	Core – Linear Algebra	6	3	25	75	100	4
	III		DSEC-IV	6	3	25	75	100	4
	III	22OUMA63	Core- Programming in C	4	3	25	75	100	4
	III	22OUMA6P	Core- Practical in C	2	3	40	60	100	1
	IV	22OUMASE61	SEC- Discrete Mathematics	2	3	25	75	100	2
	IV	22OUMASE62	SEC- Combinatorics	2	3	25	75	100	2
	IV	22OUAECVE6	AECC- Value Education	2	3	25	75	100	2
	V	22OU5NS4/ 22OU5PE4	Extension Activities: N.S.S/Physical Education	-	3	25	75	100	1
Total				180					140

GEC- Generic Elective Course

SEC- Skill Enhancement Course

DSEC- Discipline Specific

Elective Course **AECC-** Ability

Enhancement Compulsory Course

IDC- Inter Disciplinary Course

DSEC: Discipline Specific Elective Course:**• Semester III (DSEC –I Choose any one)**

Operations Research - 22OUMADSE3A

Astronomy - 22OUMADSE3B

• Semester IV (DSEC – II Choose any one)

Number Theory - 22OUMADSE4A

Stochastic Process - 22OUMADSE4B

• Semester V (DSEC- III Choose any one)

Numerical Methods - 22OUMADSE5A

Fuzzy Mathematics - 22OUMADSE5B

• Semester VI (DSEC –IV Choose any one)

Graph Theory – 22OUMADSE6A

Automata theory and Formal Language-22OUMADSE6B

NOTE:

The students are permitted to obtain additional credits (Optional) MOOCs

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
V	Core	22OUMA51	Modern Analysis	6	6	25	75	100

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

Course Objectives:

1. Understand countability, countable sets match natural numbers, distinguish from uncountable sets.
2. Master metric spaces, grasp properties and examples.
3. Proficiency in continuity, uniform continuity, homeomorphisms in analysis.
4. Comprehend connectedness, its relation to continuity.
5. Learn compactness principles in metric spaces, crucial in analysis and topology.

Course Content:

UNIT I: Countable Sets - Uncountable Sets – Inequalities of Holder and Minkowski
- Metric Spaces -Definitions and Examples – Bounded Sets in a Metric space - Open Ball in a Metric Space – Open Sets – Subspace - Interior of a set.

UNIT II: Closed Sets – Closure - Limit Point - Dense Sets – Complete Metric Spaces- Completeness- Baire's Category Theorem.

UNIT III: Continuity – continuity - homeomorphism– uniform continuity.

UNIT IV: Connectedness - Definition and Examples - Connected Subsets of \mathbb{R} - Connectedness and Continuity

UNIT V: Compactness –Compact Metric Space- Compact Subsets of \mathbb{R} – Equivalent Characterization for Compactness

Books for Study:

S. Arumugam and A. Thangapandi Isaac, *Modern Analysis*, New Gamma Publishing House, Palayamkotai (2012).

Chapters:

- Unit I: Chapter 1: Sections (1.2 to 1.4) &
Chapter 2: Sections (2.1 to 2.6)
- Unit II: Chapter 2: Sections (2.7 to 2.10) &
Chapter 3: Sections (3.1 & 3.2)
- Unit III: Chapter 4: Sections (4.1 to 4.3)
- Unit IV: Chapter 5: Section (5.1 to 5.3)
- Unit V: Chapter 6: Sections (6.1 to 6.3)

Books for Reference:

1. Chandrasekhara Rao K., Narayanan K.S. *Real Analysis –Volume I* Viswanathan Printers 2008
2. Richard R. Goldberg, *Methods of real Analysis*, Oxford & IBH Publishing Co. PVT., LTD. (1970).
3. Prof. Venkatachalapathy S.G., M.Sc., *Real Analysis* 2006, Margham Publications (2nd Edition)

Web Resources:

1. <https://www.jirka.org/ra/realanal.pdf>
2. <https://www.geneseo.edu/~aguilar/public/assets/courses/324/real-analysis-cesar-aguilar.pdf>
3. https://www3.nd.edu/~lnicolae/Hon_Calc_Lectures.pdf

Pedagogy:

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

Rationale for nature of Course:**Knowledge and Skill:**

- Understanding metric spaces is crucial for analyzing the structure and properties of different spaces in mathematics. Gain proficiency in solving problems related to metric spaces, including identifying bounded sets, open balls, and understanding the concepts of open and closed sets.
- Enhance problem-solving abilities related to continuity, connectedness, and compactness.

Activities to be given:

Work in groups to classify different sets as countable or uncountable. Provide justifications for your classifications and discuss any interesting properties of these sets

Course learning Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Applying the properties of real numbers.	K1 to K3
CLO2	Construct rigorous mathematical proofs of basic results in real analysis.	K1 to K3
CLO3	Students will be able to demonstrate ability to use Mean value Theorem to compute limits of functions.	K1 to K4
CLO4	Understand concepts of connectedness	K1 to K4
CLO5	Understand concepts of compactness of metric spaces	K1 to K4

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

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

1-Basic Level**2-Intermediate Level****3-Advanced Level**

Lesson Plan:

UNIT	DESCRIPTION	HRS.	MODE
I	Countable Sets - Uncountable Sets – Inequalities of Holder and Minkowski - Metric Spaces -Definitions and Examples – Bounded Sets in a Metric space - Open Ball in a Metric Space – Open Sets – Subspace - Interior of a set	18	Chalk and Talk & PPT
II	Closed Sets – Closure - Limit Point - Dense Sets – Complete Metric Spaces- Completeness - Baire’s Category Theorem.	18	Chalk and Talk
III	Continuity-continuity-homeomorphism– uniform continuity.	18	Chalk and Talk & Group discussion
IV	Connectedness - Definition and Examples - Connected Subsets of R - Connectedness and Continuity	18	Chalk and Talk & On the spot test
V	Compactness –Compact Metric Space- Compact Subsets of R – Equivalent Characterization For Compactness	18	Chalk and Talk
Total		90 hours	

Course Designer: R.R.Subanya

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
V	Core	22OUMA52	Statistics	5	6	25	75	100

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

Course Objectives:

- Understand and Apply Moments, Skewness, and Kurtosis
- Analyze Correlation and Regression
- Understand the Theory of Attributes
- Calculate and Interpret Index Numbers
- Apply Probability Concepts

Course Content:

Unit I: Moments, Skewness and Kurtosis: Moments – Skewness and Kurtosis – **Curve Fitting** – Principle of least squares.

Unit II: Correlation and Regression: Correlation – Rank Correlation – Regression – Correlation - Co- Efficient for a Bivariate Frequency Distribution.

Unit III: Theory of Attributes: Attributes- Consistency of data – Independence and Association of data.

Unit IV: Index Number: Index Numbers – Consumer Price Index Number (cost of living index numbers)

Unit V: Probability: Probability – Conditional Probability.

Book for study:

S. Arumugam and A. Thangapandi Isaac *Statistics* (July 2011) New Gamma Publishing House, Palayamkottai

Chapters:

- Unit I: Chapter 4: Sections (4.1 to 4.2) & Chapter 5
Unit II: Chapter 6: Sections (6.1 to 6.4)
Unit III: Chapter 8: Sections (8.1 to 8.3)
Unit IV: Chapter 9: Sections (9.1 to 9.2)
Unit V: Chapter 11: Sections (11.1 to 11.2)

Books for Reference:

1. Dr. Gupta S.P., *Statistical methods*, Sultan Chand & Sons, Educational Publishers, New Delhi (2008).
2. Pillai R.S.N., Bagavathi V., *Statistics*, 7th Edition, S. Chand and Company Ltd. (2014).
3. Veerarajan T., *Probability, Statistics and Random Processes*, 3rd Edition, Tata McGraw Hill Education Pvt Ltd.

Web Resources/E Books:

- <https://math.iisc.ac.in/~manju/UGstatprob16/statprob.pdf>
- <https://t.ly/YLTuZ>
- <https://t.ly/5Oyiy>

Pedagogy:

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

Rationale for nature of Course:**Knowledge and Skill:**

- This curriculum covers statistical concepts such as moments, correlation, regression, probability, and index numbers, equipping students with analytical skills to interpret data, understand relationships, and make informed decisions in various fields.
- Through practical applications and theoretical understanding, students develop proficiency in statistical analysis and probability modeling, crucial for problem-solving and decision-making in economics, finance, social sciences, and beyond.

Activities to be given:

- Data analysis projects and curve fitting exercises.
- Case studies and research projects on correlation and regression.

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 K Levels)
CO1	To determine the principle of least squares	Up to K4
CO2	To compute Correlation Regression, Bivariate Frequency Distribution.	Up to K4
CO3	To construct Attributes, Consistency of data, Independence and Association of data.	Up to K4
CO4	To determine Index Numbers, Consumer Price Index Number sample problem.	Up to K5
CO5	To analyze the Conditional Probability.	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	Moments, Skewness and Kurtosis Principle of least squares.	18	Chalk And Talk
II	Correlation, Rank Correlation, Regression, Correlation Co- Efficient for a Bivariate Frequency Distribution	18	Chalk And Talk & PPT
III	Attributes- Consistency of data – Independence and Association of data.	18	Chalk And Talk
IV	Index Numbers, Consumer Price Index Number.	18	Chalk And Talk & Group Discussion
V	Probability, Conditional Probability	18	Chalk And Talk
Total		90 hours	

Course Designer: S.Selvi

Department of Mathematics						III B.Sc.		
Sem	Category	Course Code	Course Title	Credits	Contact Hours /week	CIA	SE	Total
V	Core	22OUMA53	Mechanics	5	6	25	75	100

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

Course Objectives:

1. To grasp principles of forces at a point, find resultant, components.
2. To learn rigid body forces, parallel forces, moment effects.
3. To study projectile motion, including inclined planes.
4. To understand impact dynamics, impulses in fixed planes.
5. To explore velocity, acceleration components in central orbits, solve related differential equations.

Course Content:

Unit I: Forces acting at a point – Resultant and components –Parallelogram law of forces – Triangle law of forces –Lami’s theorem –Resolution of a force – Theorem on resolved parts

Unit II: Resultant of two like parallel forces acting on a Rigid Body- resultant of two unlike and unequal parallel forces acting on a rigid body - Parallel forces acting on a rigid body – Conditions of equilibrium of three coplanar parallel forces - Moment of a force - Varignon’s Theorem -laws of Friction-Coefficient of Friction-angle of friction-cone of friction

Unit III: Projectiles- Two fundamental principles - path of Projectiles- characteristics of the motion of a projectile – Horizontal Range of Projectile – Range on an inclined plane

Unit IV: Impact-Fundamental laws of impact – Impact of a smooth sphere on a fixed smooth plane – Direct Impact of two smooth spheres - Oblique impact of two smooth spheres

Unit V: Motion under the action of central forces -Velocity and acceleration in polar coordinates – Equations of motion in polar coordinates – Note on the equiangular spiral - differential equation of central orbits- perpendicular from the pole on the tangent, formulae in polar coordinates - pedal equation of central orbit

Books for study:

1. M.K. Venkatarama, *Statics*, 13th Edition, Agasthiar Publications 17th Edition (2014).

2. M.K. Venkatarama, *Dynamics*, Agasthiar Publications 16th Edition (2014).

Chapters:

Unit I: Chapter II: Section (1 to 5, 9, 11, 13) (BOOK 1)

Unit II: Chapter III: Section (2 to 5, 7, 12) (BOOK 1)

Chapter VII: Section (3 to 8) (BOOK 1)

Unit III: Chapter VI: Section (2 to 5, 7 to 9 & 12) (BOOK 2)

Unit IV: Chapter VIII: Section (2 to 5, 7) (BOOK 2)

Unit V: Chapter XI: Section (2 to 4, 6 to 8) (BOOK 2)

Books for Reference:

1. P. Duraipandian and others, *Mechanics*, S.Chand Publishing Company , 1997

2. Dr.M.D.Raisinghania, *Dynamics*, S. Chand

Company, 2006 3.Venkatachalapathy S.G. *Mechanics*, margham publications -2007

Web Resources:

1. <https://oxvard.wordpress.com/wp-content/uploads/2018/05/engineering-mechanics-dynamics-7th-edition-j-l-meriam-l-g-kraige.pdf>
2. <https://www.hzu.edu.in/engineering/engineering-mechanics-statics-7th-edition-j-l-meriam-l-g-kraige.pdf>

Pedagogy:

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

Rationale for nature of Course:**Knowledge and Skill:**

This course aims at facilitating the student to understand the concept of problems on Forces acting on a rigid body, law of Friction, Impact and their applications. The field has its origin in the area of projectiles and central orbit.

Activities to be given:

Perform experiments to observe the trajectory of projectiles. Measure range and height, and analyze the effect of different angles of projection on the projectile's path

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 K Levels)
CO1	Understand the concept of Triangle law of forces and Lami's theorem	Up to K4
CO2	Discuss the concept of forces acting on a rigid body and friction	Up to K4
CO3	Understand the concept of Projectiles and inclined plane	Up to K4
CO4	To analyze the concept of impulse and impact	Up to K5
CO5	Understand the concept of central orbit and pedal equation	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	2	2	3
CLO2	3	3	3	3	3	2
CLO3	2	2	3	3	3	3
CLO4	2	3	2	3	3	2
CLO5	2	2	2	3	3	3

1. Basic level

2. Intermediate level

3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	Forces acting at a point – Resultant and components –Parallelogram law of forces – Triangle law of forces –Lami’s theorem – Resolution of a forces – Theorem on resolved parts	18	Chalk & Talk, PPT
II	Resultant of two like parallel forces acting on a Rigid Body- Resultanat of two unlike and unequal parallel forces acting on a rigid body - Parallel forces acting on a rigid body – Conditions of equilibrium of three coplanar parallel forces - Moment of a force -Varignon’s Theorem -laws of Friction- Coefficient of Friction-angle of friction- cone of friction	18	Chalk & Talk, PPT
III	Projectiles- Two fundamental principles - path of Projectiles- characteristics of the motion of a projectile – Horizontal Range of Projectile – Range on an inclined plane	18	Chalk & Talk, PPT
IV	Impact-Fundamental laws of impact – Impact of a smooth sphere on a fixed smooth plane –Direct Impact of two smooth spheres - Oblique impact of two smooth spheres	18	Chalk & Talk, PPT
V	Motion under the action of central forces - Velocity and acceleration in polar coordinates – Equations of motion in polar coordinates – Note on the equiangular spiral -differential equation of central orbits-perpendicular from the pole on the tangent, formulae in polar coordinates - pedal equation of central orbit	18	Chalk & Talk, PPT
Total			90 hours

Course Designer: Dr.R.Mangayarkarasi

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
V	DSEC	22OUMADSE5A	Numerical Methods	4	6	25	75	100

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

Course Objective:

- Solve Algebraic and Transcendental Equations Using Iterative and Root-finding Methods.
- Explore Finite Differences and Interpolation Techniques for Data Approximation.
- Apply Numerical Differentiation and Integration Methods for Function Analysis.
- Master Numerical Solutions of Ordinary Differential Equations using Iterative Techniques.
- 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 – 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)

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/EBooks:

1. <https://gdcoysang.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/202004032250571912siddhart_h_bhatt_engg_Numerical_Differentiation_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:

- Implement and compare iteration, bisection, and Newton Raphson root- finding methods.
- Implement iterative techniques for solving ordinary differential equations, compare methods.

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 K Levels)
CO1	Root-finding and Equation Solving	Up to K4
CO2	Understand finite differences, interpolation techniques Thoroughly.	Up to K4
CO3	Apply numerical differentiation, integration methods Effectively.	Up to K4
CO4	Solve ordinary differential equations using iterations.	Up to K5
CO5	Apply iterative techniques effectively for solving ODEs.	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	2	3	-
CLO2	3	2	2	2	3	-
CLO3	3	2	2	3	3	-
CLO4	3	3	3	3	3	-
CLO5	3	3	3	3	3	-

1. Basic level

2. Intermediate level

3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	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	12	Chalk and Talk & PPT
II	Finite Differences –Difference operators - Other Difference operators	12	Chalk and Talk
III	Interpolation - Newton’s Interpolation Formula - Lagrange’s Interpolation formula - Divided Differences - Newton’s Divided differences formula – Inverse Interpolation	12	Chalk and Talk
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.	12	Chalk and Talk& On the spot test
V	Numerical Solutions of Ordinary Differential Equations – Taylor’s Series Method – Picard’s Method - Euler’s Method – Runge-Kutta Method.	12	Chalk and Talk
Total		60 hours	

Course Designer: Dr. P.Vidhya

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
V	DSEC	22OUMADSE5B	Fuzzy Mathematics	4	6	25	75	100

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

Course Objectives:

- Understand the fundamentals of Crisp and Fuzzy Sets
- Master Operations on Fuzzy Sets
- Analyze Fuzzy Relations
- Explore Compatibility and Tolerance Relations
- Learn Morphisms and Fuzzy Relation Equations

Course Content:

UNIT I: Crisp sets and Fuzzy sets -Introduction - Crisp sets - The notion of fuzzy Sets-Basic concepts of fuzzy sets- classical logic- fuzzy logic.

UNIT II: Operations on Fuzzy Sets -General discussion -fuzzy complement- fuzzy union - fuzzy intersection - combinations of operations - general aggregation operations.

UNIT III: Fuzzy relations - Crisp and fuzzy relations - binary relations - binary relations on a single set - equivalence and similarity relations.

UNIT IV: Compatibility or tolerance relations - Orderings.

UNIT V: Morphisms - Fuzzy relation equations.

Book for study:

George J.Klir and T.A.Folger,Fuzzy Sets, Uncertainty and Information, Prentice Hall of India (2012)

Chapters:

- Unit I: Chapter 1: Sections (1.1 to 1.6)
 Unit II: Chapter 2: Sections (2.1 to 2.6)
 Unit III: Chapter 3: Sections (3.1 to 3.4)
 Unit IV: Chapter 3: Sections (3.5 and 3.6)
 Unit V: Chapter 3: Sections (3.7 and 3.8)

Books for Reference:

1. Dr. Bhargava A.K., Fuzzy Set Theory Fuzzy Logic and Their Applications, S.Chand & Company Pvt. Ltd.(2013).
2. George J.Klir and Bo Yuan, Fuzzy sets Fuzzy Logic, Theory and Applications, Prentice Hall of India (2002).

Web Resources/E Books:

1. https://www.researchgate.net/publication/270396929_AN_INTRODUCTI_ON_TO_FUZZY_SET_THEORY_AND_FUZZY_LOGIC
2. <https://freecomputerbooks.com/Fuzzy-Logic-Controls-Concepts-Theories-and-Applications.html>
3. https://books.google.co.in/books/about/Fuzzy_Set_Theory_and_Its_Applications.html?id=oJYSpp_0M6MC&redir_esc=y

Pedagogy:

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

Rationale for nature of Course:**Knowledge and Skill:**

- Grasp the fundamental concepts and differences between crisp sets and fuzzy sets, including basic operations.
- Analyze and interpret fuzzy relations and equations in various scenarios.

Activities to be given:

Solve problems involving the basic concepts and operations of fuzzy sets, including unions, intersections, and complements and engage in exercises that distinguish between classical logic and fuzzy logic.

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 concepts of fuzzy sets	Up to K4
CO2	Examine the concept of operations on fuzzy sets	Up to K4
CO3	Determine the fuzzy relations	Up to K4
CO4	Analyze the concept of orderings.	Up to K5
CO5	Analyze the fuzzy relation 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	3	3	2	2	3	-
CLO2	3	2	2	2	3	-
CLO3	3	2	2	3	3	-
CLO4	3	3	3	3	3	-
CLO5	3	3	3	3	3	-

1. Basic level

2. Intermediate level

3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	Crisp sets and Fuzzy set Introduction – Crisp set. The notion of fuzzy sets-Basic concepts of fuzzy sets-classical logic- fuzzy logic	12	Chalk and Talk & PPT
II	Operations on Fuzzy Sets -General discussion - fuzzy complement- fuzzy union - fuzzy intersection - combinations of operations - general aggregation operations.	12	Chalk and Talk
III	Fuzzy relations - Crisp and fuzzy relations - binary relations - binary relations on a single set - equivalence and similarity relations.	12	Chalk and Talk
IV	Compatibility or tolerance relations - Orderings.	12	Chalk and Talk& On the spot test
V	Morphisms - Fuzzy relation equations.	12	Chalk and Talk
Total			60 hours

Course Designer: Dr.G.AlarmeluMangai

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
V	SEC	22OUMASE51	Quantitative Aptitude	2	2	25	75	100

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

Course Objectives:

- Develop Efficient Problem-Solving Technique
- Strengthen Fundamental Mathematical Skills
- Enhance Problem-Solving Speed and Accuracy
- Master the Use of Formulas and Shortcuts
- Improve Analytical and Logical Thinking

Course Content:

Unit I: Problems on Numbers & Problems on Ages

Unit II: Profit and Loss-Ratio and Proportion

Unit III: Time and Work-Time and Distance

Unit IV: Averages - Probability

Unit V: Permutations and Combinations – Heights & Distance

Book for study:

R.S. Aggarwal, *Quantitative Aptitude for Competitive Examinations*, Sultan Chand & Sons Company, (2007).

Chapters:	Unit-I:	Chapter 7 & Chapter 8
	Unit-II:	Chapter 11 & Chapter 12
	Unit-III:	Chapter 15 & Chapter 17
	Unit-IV:	Chapter 6 & Chapter 31
	Unit-V:	Chapter 30 & Chapter 34

Books for Reference:

1. Abhijit Guha, *Quantitative Aptitude*, Tata McGraw Hill Publishing Company (2011)
2. Dinesh Knaltar, *Quantitative Aptitude*, Dorling Kindersley (India) Pvt Ltd. (2008).

Web Resources/E Books:

1. <https://rambagali.wordpress.com/wp-content/uploads/2017/05/quantitative-aptitude-ramandeep-singh.pdf>
2. <https://d5ofvi41ggben.cloudfront.net/4966d784-a71b-4c11-b31e-801ee59d95c0-1571828515642-quantitative-aptitude.pdf>
3. <https://wpassets.adda247.com/wp-content/uploads/multisite/2023/03/02190946/200-Questions-of-Quantitative-Aptitude.pdf>

Pedagogy:

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

Rationale for nature of Course:**Knowledge and Skill:**

This course aims at facilitating the student to understand the concept of problems on numbers, probability, permutations, Combinations and their applications

Activities to be given: Students have the ability to work on challenging problems during class hours can be discussed and further difficulties can be worked through in class

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 K Levels)
CO1	Understand the Problems on Numbers & Ages	Up to K4
CO2	Analyze the problems on Profit, Loss, Ratio and Proportion	Up to K4
CO3	Determine the Time and Work-Time and Distance	Up to K4
CO4	Analyze the problems on Averages and Probability	Up to K5
CO5	Determine the problems on Permutations and Combinations	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	2	2	-
CLO2	3	3	2	3	3	-
CLO3	3	3	1	2	2	-
CLO4	2	3	2	1	3	-
CLO5	3	3	2	3	3	-

1. Basic level

2. Intermediate level

3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	Problems on Numbers & Problems on Ages	6	Chalk & Talk and PPT
II	Profit and Loss-Ratio and Proportion	6	Chalk & Talk and PPT
III	Time and Work-Time and Distance	6	Chalk & Talk and PPT
IV	Averages - Probability	6	Chalk & Talk and PPT
V	Permutations and Combinations – Heights & Distance	6	Chalk & Talk and PPT
		Total	30 hours

Course Designer: Dr.R.Mangayarkarasi

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
V	SEC	22OUMASE5P	Latex Lab	2	2	40	60	100

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

Course Objectives:

- Install and configure LaTeX with Kile and MiKTeX, handling errors.
- Customize document appearance and text formatting professionally.
- Master mathematical typesetting with equations and matrices.
- Create diagrams and graphics using LaTeX.
- Manage advanced document elements including bibliographies, citations, indexes, and glossaries.

Course Content:

Unit 1: Latex Basics: What is TeX? -What is LaTeX? -How LaTeX works –**The LaTeX Input**

File: Entering LaTeX Commands-Entering Text-Special Characters-Structure of the Input File- Some LaTeX Vocabulary.

Unit 2: Creating A LaTeX Document: Document Classes-Class Options-Packages-Making a Title Page-Making a Table of Contents-Behind the Scenes: Auxiliary Files-How a Page is Built-Example: Report Class-Example: Letter Class.

Unit 3: Document Layout: Line Spacing-Paragraphs-Text Justification-Margins-Headers, Footers, and page Numbering.

Unit 4: Within the Text: Section Headings-Changing Type Style and Size-Starting New Lines and New Pages-Leaving Horizontal and Vertical Space-Drawing Rules-Footnotes-Centering-Quotations-Reproducing Text As-Is,Lists-Cross References.

Unit 5: Mathematics: In-Line Math-Display Math (for numbered equations)-Equation Environment (for numbered equations)-Eqnarray Environment (for multiline equations)-Array Environment (for matrices, ect.) **Buliding Mathematical Expressions:** Superscripts and Subscripts-Spaces in Math Mode- Dots, Braces, and Bars- Fractions- Radicals, integrals, and Summations-Large Delimiters.

Book for study:

Guide to LATEX, fourth edition, helmut kopka, Patrick W.Daly

Books for Reference:

1. The LaTeX Companion by Frank Mittelbach, Michel Goossens, Johannes Braams, David Carlisle, Chris Rowley, 2004, Addison-Wesley Professional
2. LaTeX: A Document Preparation System by Leslie Lamport, 1994, Addison-Wesley Professional
3. LaTeX Beginner's Guide by Stefan Kottwitz, 2011, Packt Publishing

Web Resources

1. <https://www.tug.org/twg/mactex/tutorials/ltxprimer-1.0.pdf>
2. https://www.latex-project.org/help/books/bookpart_tlc2-ch0.pdf
3. <https://www.heinrichfleck.net/latex/Lamport%20.pdf>
4. https://www.math.ucdavis.edu/~tracy/courses/math129/Guide_To_LaTeX.pdf
5. <https://www.maths.tcd.ie/~dwilkins/LaTeXPrimer/GSWLaTeX.pdf>

Pedagogy:

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

Rationale for nature of Course:

Knowledge and Skill:

LaTeX proficiency requires understanding syntax, professional formatting, mathematical typesetting, package use, citation management, version control integration, error troubleshooting, layout customization, and workflow optimization, honed through practice and engagement.

Entrepreneurial:

Encourage students to explore opportunities for offering LaTeX typesetting and document preparation services to researchers, academics, and professionals, leveraging their expertise for freelance or consulting work.

Activities to be given:

1. Create a document template incorporating various LaTeX features such as sections, equations, tables, and citations, then ask learners to populate it with content to practice formatting and typesetting.
2. Assign a collaborative writing task where students use LaTeX with version control to collectively draft and edit a document, fostering teamwork and proficiency in collaborative workflows.

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 K Levels)
CO1	Introduction to LaTeX basics.	K1 to K3
CO2	Creating structured LaTeX documents effectively	K1 to K3
CO3	Controlling document layout and formatting efficiently.	K1 to K4
CO4	Formatting text and elements within documents	K1 to K3
CO5	Mastering mathematical typesetting in LaTeX.	K1 to K4

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	2	3	-
CLO2	3	3	1	2	2	-
CLO3	3	2	2	3	3	-
CLO4	3	3	2	1	2	-
CLO5	3	3	3	3	3	-

1. Basic level**2. Intermediate level****3. Advanced level****Lesson plan:**

Unit	Description	Hours	Mode
I	Installation of Kile and MikeTex, Class and packages, Latex programming and commands, sample packages, error messages: some errors, list of LaTeX error messages.	6	Chalk and Talk & PPT
II	Customizing document appearance: fonts, sizes, and styles, Handling text formatting: bold, italics, underline, and special characters, Utilizing environments for specialized formatting: lists, tables, and figures	6	Chalk and Talk & PPT
III	Introduction to mathematical typesetting in LaTeX, Writing mathematical expressions and equations, Using math environments: equations, align, and matrices.	6	Chalk and talk & PPT
IV	Picture environment, extended pictures, other drawing packages	6	Chalk and Talk & PPT
V	Advanced Document Elements: Managing bibliographies and citations with BibTeX or BibLaTeX, creating indexes, glossaries, and lists of abbreviations	6	
Total		30 hours	

Course Designer: R.Revathy

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
VI	Core	22OUMA61	Complex Analysis	6	6	25	75	100

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

Course Objectives:

1. To have the knowledge on basic properties of the Field of complex numbers
2. Study the techniques of complex variables and functions together with Their derivatives, Contour integration and transformations.
3. To enrich the knowledge on Cauchy Integral formula and fundamental theorems.
4. To study complex power series, classification of singularities,
5. To learn calculus of residues and its applications in the evaluation of integrals

Course Content:**UNIT I:**

Analytic functions: Functions of a complex variable – Limits – Theorems on limit – Continuous functions – Differentiability – The Cauchy Riemann equations - Analytic Functions – Harmonic functions.

UNIT II:

Bilinear transformations: Elementary transformations – Bilinear transformations – Cross ratio – Fixed points of bilinear transformations – Some special bilinear transformations.

UNIT III:

Complex Integration: Definite integral – Cauchy's theorem – Cauchy's integral formula – Higher derivatives.

UNIT IV:

Series expansions – Taylor's series – Laurent's series – Zeros of an analytic function – Singularities.

UNIT V:

Calculus of residues: Residues – Cauchy's Residue theorem – Evaluation of definite integrals

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 2.8)

Unit II: Chapter 3

Unit III: Chapter 6

Unit IV: Chapter 7

Unit V: Chapter 8 – Section (8.1, 8.2, 8.3)

Reference Books:

1. P. Durai Pandian and Others, *Complex Analysis*, S. Chand Publishing Company, 2014.
2. Dr. R. Roopkumar, *Complex Analysis*, Pearson Education India, 2014.
3. T.K.M.Pillai, Dr.S.P.Rajagopalan and Dr.R.Sattanathan, *Complex Analysis*, S. Vishwanathan Private Ltd., 2009.

Web Resources/E Books

1. <http://www.maths.lth.se/~olofsson/CompHT06.pdf>
2. <https://www.math.ucdavis.edu/~romik/data/uploads/notes/complex-analysis.pdf>
3. <https://web.math.princeton.edu/generals/complex13.pdf>

Pedagogy:

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

Rationale for nature of Course:**Knowledge and Skill:**

To make students able to find the singularities and Series expansions

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 Outcomes (CLO's):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy (Up to K level)
CLO1	Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions	K1 to K3
CLO2	Find Fixed points of bilinear transformations	K1 to K3
CLO3	Understand Cauchy theorem and Cauchy integral formulas and apply these to evaluate complex contour integrals	K1 to K4
CLO4	Represent functions as Taylor and Laurent series; classify singularities and poles.	K1 to K4
CLO5	Find residues and evaluate complex integrals using the residue theorem.	K1 to K4

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

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

1-Basic Level**2-Intermediate Level****3-Advanced Level**

Lesson plan:

Unit	Description	Hours	Mode
I	Analytic functions: Functions of a complex variable – Limits – Theorems on limit – Continuous functions – Differentiability – The Cauchy Riemann equations - Analytic Functions – Harmonic functions.	18	Chalk and Talk & PPT
II	Bilinear transformations: Elementary transformations – Bilinear transformations – Cross ratio – Fixed points of bilinear transformations – Some special bilinear transformations.	18	Chalk and Talk
III	Complex Integration: Definite integral – Cauchy's theorem – Cauchy's integral formula – Higher derivatives.	18	Chalk and Talk& Group discussion
IV	Series expansions – Taylor's series – Laurent's series – Zeros of an analytic function – Singularities.	18	Chalk and Talk& On the spot test
V	Series expansions – Taylor's series – Laurent's series – Zeros of an analytic function – Singularities.	18	Chalk and Talk
TOTAL		90 hours	

Course Designer: R.R.Subanya

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours /Week	CIA	SE	Total
VI	Core	22OUMA62	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 the linear transformation.
- To find the solution of Inner product space
- To enable the students to understand theory of matrices
- Determine the elementary transformations of matrices.

Course Content:

UNIT I: Vector Spaces: Definition and Examples – Subspaces - Linear Transformations

UNIT II: Vector Spaces: Span of a set - Linear Independence - Basis and Dimension
- Rank and Nullity - Matrix of a Linear Transformation.

UNIT III: Inner Product Space: Definition and Examples – Orthogonality -
Orthogonal Complement

UNIT IV: Theory of Matrices: Algebra of Matrices – Types of Matrices – The
Inverse of Matrix

UNIT V: Theory of Matrices: Elementary Transformations – Rank of a Matrix–
Simultaneous Linear Equations – Characteristic Equation and Cayley Hamilton
Theorem - Eigen Values and Eigen vectors.

Book for study:

S. Arumugam and A. Thangapandi Isaac, Modern Algebra, SCITECH Publications (INDIA)
Pvt.,Ltd (2003)

Chapters:

- Unit I: Chapter 5: Sections (5.1 to 5.3)
- Unit II: Chapter 5: Sections (5.4 to 5.8)
- Unit III: Chapter 6: Sections (6.1 to 6.3)
- Unit IV: Chapter 7: Sections (7.1 to 7.3)
- Unit V: Chapter 7: Section (7.4 to 7.8)

Books for Reference:

1. Krishnamurthy V, Arora J.L, Linear Algebra Affiliated East- west Press PVT. LTD. 1976.
2. Schaum's Outlines by Linear Algebra TATA Mcgraw-Hill Edition, 2012.

Web Resources/E Books:

1. <https://open.umn.edu/opentextbooks/textbooks/5>
2. [https://students.aiu.edu/submissions/profiles/resources/onlineBook/Y5B7M4 Introduction to Linear Algebra- Fourth Edition.pdf](https://students.aiu.edu/submissions/profiles/resources/onlineBook/Y5B7M4%20Introduction%20to%20Linear%20Algebra-%20Fourth%20Edition.pdf)
3. <https://home.cs.colorado.edu/~alko5368/lecturesCSCI2820/mathbook.pdf>

Pedagogy:

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

Rationale for nature of Course:**Knowledge and Skill:**

- Gain a comprehensive understanding of vector spaces, inner product spaces, and the theory of matrices, including their properties, operations, and applications.
- Apply concepts such as linear transformations, orthogonality, matrix operations, and eigenvalues to solve mathematical problems and analyze linear systems.

Activities to be given:

- Solve exercises involving vector spaces, linear transformations, and matrix operations to reinforce theoretical understanding.
- Perform computations related to inner product spaces, orthogonality, eigenvalues, and apply the Cayley-Hamilton theorem to practical problems.

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 K Levels)
CO1	Understand the concepts of vector spaces	Up to K4
CO2	Determine Linear transformations	Up to K4
CO3	Determine the concept of Inner product spaces	Up to K4
CO4	Understand the concept of Matrices	Up to K5
CO5	Determine the Elementary transformation of matrices	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	2	3	-
CLO2	3	3	1	2	2	-
CLO3	3	2	2	3	3	-
CLO4	3	3	2	1	2	-
CLO5	3	3	3	3	3	-

1. Basic level

2. Intermediate level

3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	Vector Spaces- Definition and Examples – Subspaces - Linear Transformations	18	Chalk & Talk, PPT
II	Vector Spaces- Span of a set - Linear Independence - Basis and Dimension - Rank and Nullity - Matrix of a Linear Transformation.	18	Chalk & Talk, PPT
III	Inner Product Space- Definition and Examples – Orthogonality -Orthogonal Complement	18	Chalk & Talk, PPT
IV	Theory of Matrices- Algebra of Matrices – Types of Matrices – The Inverse of Matrix	18	Chalk & Talk, PPT
V	Theory of Matrices- Elementary Transformations – Rank of a Matrix– Simultaneous Linear Equations – Characteristic Equation and Cayley Hamilton Theorem - Eigen Values And Eigen vectors.	18	Chalk & Talk, PPT
		Total	90 hours

Course Designer: Dr.G.Alarmelu Mangai

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/Week	CIA	SE	Total
VI	DSEC	22OUMADSE6A	Graph Theory	4	6	25	75	100

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

Course Objectives:

- Understand Fundamental Concepts of Graph Theory: Graphs, Subgraphs, Isomorphism.
- Explore Graph Representation using Matrices and Operations.
- Learn Properties and Characteristics of Eulerian, Hamiltonian Graphs, and Trees.
- Study Matchings, Planarity, and Coloring in Graphs.

Course Content:

UNIT I: Graphs and Sub graphs: Definitions and Examples, Degree- Sub graphs- Isomorphism- Independent Sets and Coverings

UNIT II: Matrices-Operations on Graphs, Connectedness: Walks, Trails and Paths- Connectedness and Components-Blocks

UNIT III: Eulerian and Hamiltonian Graphs: Introduction- Eulerian Graphs- Hamiltonian graphs, Trees: Introduction-Characterization of Trees - Centre of a Tree

UNIT IV: Matchings -Matchings in Bipartite Graphs- Planarity- Definition and Properties- Characterization of Planar Graphs-Thickness, Crossing and Outer Planarity.

UNIT V: Colourability: Chromatic Numbers and Chromatic Index-The Five colour Theorem-Four Colour Problem

Book for study:

S.Arumugam and S.Ramachandran,*Invitation to Graph Theory*,SCITECH Publication(INDIA) pvt.,Ltd.,2016

Chapters:

Unit – I: Chapter 2:2.1 to 2.4 &2.6

Unit – II: Chapter 2:2.8 &2.9 & Chapter 4:4.1 to 4.3

Unit – III: Chapter 5: 5.1& 5.2, Chapter 6:6.1 &6.2

Unit – IV: Chapter 7: 7.1&7.2 & Chapter 8:8.1 to 8.3

Unit – V: Chapter 9: 9.1 to 9.3

Books for Reference:

1. Choudum S.A., *A First Course in Graph Theory*, Macmillan India Limited, Madras.(1994)
2. John clark , Derek Allantolton, *A first look at Graph Theory*, Allied publisher Ltd(1991).
3. Dr. Murugan M.,*Graph theory and Algorithm* Muthali Publishing House(2003)
4. Narsingh Deo,*Grapy Theory With Applications to Engineering and Computer Science*, PHI Learning Private Limited,New Delhi(2010).

Web Resources/E Books:

1. <https://www.shahucollegelatur.org.in/Department/Studymaterial/sci/it/BCS/FY/book.pdf>
2. https://www.academia.edu/35284015/Graph_Theory_With_Applications_To_Engineering_And_Computer_Science_by_Narsingh_Deo
3. <https://link.springer.com/book/10.1007/978-3-662-53622-3>

Pedagogy:

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

Rationale for nature of Course:**Knowledge and Skill:**

- Graph theory basics, matrix representation, Eulerian and Hamiltonian properties, matching theory, planar graphs, and coloring concepts.
- Analyzing graphs, performing matrix operations, identifying graph properties, solving matching and planarity problems, determining chromatic numbers.

Activities to be given:

- Perform matrix operations on graphs, analyze connectivity, and identify components and blocks.
- Solve matching problems in bipartite graphs, analyze planarity, and apply coloring concepts to solve problems.

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 K Levels)
CO1	Understand the basic concept of graphs	Up to K4
CO2	Examine the concept of Matrices and connectedness	Up to K4
CO3	Determine the concept of Eulerian and Hamiltonian Graphs	Up to K4
CO4	Analyze the concept of matchings and Planarity	Up to K5
CO5	Analyze the topics of colourability	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	2	3	-
CLO2	3	2	2	2	3	-
CLO3	3	2	2	3	3	-
CLO4	3	3	3	3	3	-
CLO5	3	3	3	3	3	-

1. Basic level

2. Intermediate level

3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	Graphs and Sub graphs, Degree Isomorphism, Independent Sets and Coverings	12	Chalk and Talk & PPT
II	Matrices, Connectedness and Components Blocks	12	Chalk and Talk
III	Eulerian and Hamiltonian Graphs, Trees	12	Chalk and Talk & Group discussion
IV	Matchings, Planarity	12	Chalk and Talk & On the spot test
V	Colourability, Four Color Problem	12	Chalk and Talk
		Total	60 hours

Course Designer: T.Thivya

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
VI	DSEC	22OUMADSE6B	Automata Theory and Formal Language	4	6	25	75	100

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

Course Objectives:

- 1.To provide students with an overview of Automata Theory
- 2.To understand the Concept of Regular Expression and Language
- 3.To Construct the Context Free Grammars and Language Parse Trees
- 4.Apply the techniques of CFL and NCFL
- 5.To know about the Turing Machine

Course Content:

UNIT-I

Introduction to Finite Automata: Introduction to Finite Automata, Central Concepts of Automata Theory, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Finite Automata with Epsilon Transition.

UNIT-II

Regular Expressions and Languages: Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Proving Languages Not to Be Regular, Closure Properties of Regular Languages, Equivalence and Minimization of Automata –Pumping Lemma

UNIT-III

Context Free Grammars and Languages Parse Trees: Applications of Context Free Grammars, Ambiguity in Grammars and Languages, Eliminating Useless Symbols, Computing the Generating and Reachable Symbols, Eliminating Epsilon Productions, Eliminating Unit Productions, BackusNaur Form (BNF), Chomsky Normal Form (CNF)

UNIT-IV

Pushdown Automata, CFL and NCFL: Definition of the Pushdown Automaton (PDA), The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata, The Pumping Lemma for Context Free Languages, Closure Properties of Context Free Languages, Pumping lemma for CFL, Intersections and Complements of CFL, Non- CFL

UNIT-V

Turing Machine (TM): Problems That Computers Cannot Solve, The Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Restricted Turing Machines , Turing Machines and Computers , Definition of Post's Correspondence Problem, A Language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE, Context sensitive languages and Chomsky hierarchy, Other Undecidable Problems

Books for study:

1. Automata Theory, Languages, and Computation By John Hopcroft, Rajeev Motowani, and Jeffrey Ullman
2. Elements of the Theory of Computation, Harry R. Lewis and Christos H. Papadimitriou, Pearson Education Asia.
3. Introduction to the Theory of Computation By Michael Sipser, Thomson Course Technology

Books for Reference:

1. Introduction to Languages and Automata Theory By John C Martin, Tata McGraw-Hill
2. An introduction to automata theory and formal languages By Adesh K. Pandey, Publisher: S. K. Kataria & Sons
3. Introduction to computer theory By Deniel I. Cohen , Joh Wiley & Sons, Inc
4. Computation: Finite and Infinite By Marvin L. Minsky Prentice-Hall
5. Compiler Design By Alfred V Aho, Addison Wesley

Web Resources/E Books:

1. http://en.wikipedia.org/wiki/Theory_of_computation
2. <http://meru.cecs.missouri.edu/courses/cecs341/tc.html>
3. <https://www.coursera.org/courses?query=theory%20of%20computation>
4. nptel.ac.in/courses/106104028/theory_of_computation.
5. <https://lagunita.stanford.edu/courses/course-v1:ComputerScience+Automata+SelfPaced/about>

Pedagogy:

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

Rationale for nature of Course:**Knowledge and Skill:**

To make students able to identify, formulate, analyze and solve problems.

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 K Levels)
CO1	Apply the knowledge of automata theory, grammars & regular expressions for solving the problem	Up to K4
CO2	Analyze the given automata, regular expression & grammar to know the language it represents	Up to K4
CO3	Design Automata & Grammar for pattern recognition and syntax checking	Up to K4
CO4	To distinguish between decidability and undecidability of problems	Up to K5
CO5	Identify limitations of some computational models and possible methods of proving them	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
CLO 1	3	3	2	2	3	-
CLO 2	3	2	2	2	3	-
CLO 3	3	2	2	3	3	-
CLO 4	3	3	3	3	3	-
CLO 5	3	3	3	3	3	-

1. Basic level

2. Intermediate level

3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	Introduction to Finite Automata: Introduction to Finite Automata, Central Concepts of Automata Theory, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Finite Automata with Epsilon Transition.	12	Chalk and Talk & PPT
II	Regular Expressions and Languages: Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Proving Languages Not to Be Regular, Closure Properties of Regular Languages, Equivalence and Minimization of Automata –Pumping Lemma	12	Chalk and Talk
III	Context Free Grammars and Languages Parse Trees: Applications of Context Free Grammars, Ambiguity in Grammars and Languages, Eliminating Useless Symbols, Computing the Generating and Reachable Symbols, Eliminating Epsilon Productions, Eliminating Unit Productions, Bacos Naur Form (BNF), Chomsky Normal Form (CNF)	12	Chalk and Talk& Group discussion
IV	Pushdown Automata, CFL and NCFL: Definition of the Pushdown Automaton (PDA), The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata , The Pumping Lemma for Context Free Languages , Closure Properties of Context Free Languages, Pumping lemma for CFL, Intersections and Complements of CFL, Non- CFL	12	Chalk and Talk& On the spot test
V	Turing Machine (TM): Problems That Computers Cannot Solve, The Turing Machine, Programming Techniques for Turing Machines , Extensions to the Basic Turing Machine, Restricted Turing Machines, Turing Machines and Computers , Definition of Post's Correspondence Problem, A Language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE, Context sensitive languages and Chomsky hierarchy, Other Undecidable Problems	12	Chalk and Talk
Total		60 hours	

Course Designer: N.Uma Maheswari

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
VI	Core	22OUMA63	Programming in C	4	4	25	75	100

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

Course Objectives:

- Master Basics: Constants, Variables, and Data Types in C.
- Understand Operators, Expressions, Decision Making, and Branching in C.
- Learn Arrays, Strings, and Character Arrays in C Programming.
- Explore User-Defined Functions for Modular Code in C.
- Understand Structures, Unions, and Pointers in C Programming.

Course Content:

Unit I: Overview of C – Constants, Variables and Data Types.

Unit II: Operators and Expressions – Decision Making and Branching.

Unit III: Arrays – One-dimensional arrays – Declaration and Initialization of One-dimensional Arrays- Two a dimensional array – Initializing Two-dimensional arrays – Multi-Dimensional arrays.

Unit IV: User-Defined Functions

Unit V: Structures - Pointers

Book for study:

E. Balagurusamy, Programming in Ansi C, 5th Edition, Tata Mc Graw-Hill Publishing Company Limited (2011)

Chapters:

- Unit I: Chapter 1: Sections (1.1 to 1.10)
Chapter 2: Sections (2.1 to 2.7)
- Unit II: Chapter 3: Sections (3.1 to 3.11)
Chapter 5: Sections (5.1 to 5.7)
- Unit III: Chapter 7: Sections (7.1 to 7.7)
- Unit IV: Chapter 9: Sections (9.1 to 9.10)
- Unit V: Chapter 10: Sections (10.1 to 10.8)
Chapter 11: Sections (11.1 to 11.5)

Books for Reference:

1. Ananthi Sheshasaayee , Sheshasaayee G., Programming Language C with Practicals , Second Edition, Margham Publications (2005).
2. Byron S Gottfried, Programming with C, 2nd Edition, Tata Mc Graw-Hill Publishing Company Limited (2006).
3. Ramaswamy S and Radha Ganesan , Programming in C, 1st Edition , SCITECH Publications (INDIA) PVT.,LTD (2005).

Web Resources/E Books:

- https://www.tutorialspoint.com/cprogramming/c_overview.htm
- <https://www.programiz.com/c-programming/c-operators>
- <https://www.javatpoint.com/an-array-of-strings-in-c>
- <https://www.geeksforgeeks.org/user-defined-function-in-c/>
- <https://www.geeksforgeeks.org/c-pointers/>

Pedagogy:

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

Rationale for nature of Course:**Knowledge and Skill:**

- C basics, operators, expressions, decision making, arrays, functions, structures, unions, pointers.
- Coding fundamentals, problem-solving, modular programming, memory management.

Activities to be given:

- Practice declaring variables, using operators, and making decisions.
- Engage in coding exercises, debug code, and optimize performance.

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 K Levels)
CO1	To determine the Constants, Variables and Data Types	Up to K4
CO2	To compute Operators and Expressions	Up to K4
CO3	To construct Character arrays and Strings	Up to K4
CO4	To determine User-Defined Functions	Up to K5
CO5	To analyze about Pointers	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	Overview of C – Constants, Variables and Data Types	12	Chalk and Talk
II	Operators and Expressions – Decision Making and Branching	12	Chalk and Talk & PPT
III	Arrays – Character Arrays and Strings	12	Chalk and Talk
IV	User-Defined Functions	12	Chalk and Talk & Group Discussion
V	Structures and Unions – Pointers	12	Chalk and Talk
Total		60 Hours	

Course Designer: A.Manickavalli

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
VI	Core	22OUMA6P	Programming in C (Practical)	1	2	40	60	100

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

Objective:

To gain practical knowledge of C Language by writing and executing basic programs.

List of Programs:

1. Write a program to calculate simple interest Compound interest.
2. Write a program to find the greatest number among 3 numbers.
3. Write a program to calculate the salesman commission

Number of sales:	10,000	15,000	More than 15,000
Commission :	5%	8%	10%
4. Write a Program to check a given number is Armstrong.
5. Write a program to reverse a given digit (at least 5-digit number)
6. Write a program to reverse the given string-checking Palindrome
7. Write a program to find the sum of the digits.
8. Write a program to find the nCr values using functions.
9. Write a program to sort the numbers in Ascending order (Descending order)
10. Write a program to add the given two matrices (for three -dimensional array)
11. Write a program to maintain the employee details using structure.
12. Write a program using pointers.

Course Designer: A.Manickavalli

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
VI	SEC	22OUMASE61	Discrete Mathematics	2	2	25	75	100

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

Course Objectives:

- Understand Propositional Logic Fundamentals and Connectives.
- Master Truth Tables, Tautology, and Equivalence in Logic.
- Learn Properties and Operations of Lattices and Boolean algebra.
- Introduce Recurrence Relations and Solve Examples
- Understand the Application of Modular and Distributive Lattices.

Course Content:

Unit I: Introduction- TF statements - Connectives

Unit II: Atomic and compound Statements-Well formed (statement) formulae - Truth table of a formula -Tautology– Tautological Implication and equivalence of formulae

Unit III: Lattices-Some Properties of Lattices-New Lattices

Unit IV: Modular and Distributive Lattices - Boolean algebra

Unit V: Recurrence –an introduction –Recurrence Relation – Worked Examples.

Book for study:

Dr. M.K.Venkatraman, Dr. N. Sridharan & Mr. N. Chandra sekaran *Discrete Mathematics*, The National Publishing Company (2009).

Chapters:

Unit-I: Chapter 9: Sections (9.1 to 9.3)

Unit-II: Chapter 9: Sections (9.4 to 9.8)

Unit-III: Chapter 10: Sections (10.1 to 10.3)

Unit-IV: Chapter 10: Sections (10.4 to 10.5)

Unit-V: Chapter 5: Sections (5.1 to 5.3)

Books for Reference:

1. Ramaswamy V., *Discrete Mathematical Structures with Applications to Combinatorics*, Universities Press (India) Private Limited (2006).
2. Somasundaram R.M, *Discrete Mathematical Structures*, PHI Learning Private Limited, New Delhi (2009)

Web Resources/E Books:

- <https://shorturl.at/uNHCD>
- https://books.google.com/books/about/A_Textbook_of_Discrete_Mathematics_9th_Edition.html?id=rkRxDwAAQBAJ

Pedagogy:

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

Rationale for nature of Course:**Knowledge and Skill:**

- Basics of propositional logic, truth tables, and lattices.
- Applying logic rules, analyzing lattices, solving recurrence relations.

Activities to be given:

Practice TF statement analysis and truth table construction and Work on compound statements and their equivalence proofs.

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 K Levels)
CO1	Analyze TF statements, Connectives	Up to K4
CO2	Describe Atomic and compound statements, Well- formed formulae, Truth table of a formula, Tautological	Up to K4
CO3	Derive Lattices, Some Properties of Lattices, New Lattices	Up to K4
CO4	Learn Modular and Distributive Lattices, Boolean Algebra	Up to K5
CO5	Understand Recurrence an introduction Recurrence Relation, Worked Examples	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	2	1	3
CLO2	3	2	2	2	1	3
CLO3	3	2	2	2	2	3
CLO4	3	2	2	2	2	3
CLO5	3	3	1	2	2	3

1. Basic level

2. Intermediate level

3. Advanced level

Lesson plan:

Unit	Description	Hours	Mode
I	Introduction- TF statements - Connectives	6	Chalk & Talk
II	Atomic and compound statements-Well formed (statement) formulae - Truth table of a formula -Tautology– Tautological Implication and equivalence of formulae	6	Chalk & Talk
III	Lattices-Some Properties of Lattices-New Lattices	6	Chalk & Talk
IV	Modular and Distributive Lattices - Boolean Algebra	6	Chalk & Talk
V	. Recurrence –an introduction – Recurrence Relation – Worked Examples	6	Chalk & Talk
Total		30 hours	

Course Designer: S.Selvi

Department of Mathematics						III B.Sc.		
Sem.	Category	Course Code	Course Title	Credits	Contact Hours/week	CIA	SE	Total
VI	SEC	22OUMASE62	Combinatorics	2	2	25	75	100

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

Course Objectives:

- Master Sum and Product Rules in Counting Principles.
- Understand Permutations, Combinations, and their Variations.
- Learn Binomial and Multinomial Theorems, and Their Identities.
- Explore Advanced Combinatorial Concepts: Ramsey, Catalan, Stirling Numbers.

Course Content:

UNIT I: The Rules of Sum and Product

UNIT II: Permutations - Combinations - Permutations and Combinations with Repetitions

UNIT III: The Binomial Theorem - Pascal's Identity - Vander Monde's Identity

UNIT IV: The Multinomial Theorem - Ramsey Number

UNIT V: The Catalan Numbers - Stirling Numbers and Bell Number

Book for study:

C. Vasudev, *Theory and Problems of Combinatorics* New Age International

Publishers (2008)

Chapters:

Unit I: Chapter 1: Section 1.1

Unit II: Chapter 1: Sections (1.2 to 1.4)

Unit III: Chapter 1: Section 1.5

Unit IV: Chapter 1: Sections (1.5 to 1.6)

Unit V: Chapter 1: Sections (1.7 to 1.8)

Books for Reference:

1. APTE D.P Probability And Combinatorics ,Excel Books(2007)

2. David A.Santos ,Probability An Introduction (Chapter-2) Jones and Bartlett India Pvt .Ltd First Indian Edition(2011)

Web Resources/E Books:

1. <https://www.cs.uleth.ca/~morris/Combinatorics/Combinatorics.pdf>
2. https://mathematicalolympiads.files.wordpress.com/2012/08/a_course_in_combinatorics.pdf
3. <https://batch.libretexts.org/print/Letter/Finished/math-58136/Full.pdf>

Pedagogy:

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

Rationale for nature of Course:**Knowledge and Skill:**

- Counting principles, binomial/multinomial theorems, combinatorial identities.
- Applying counting rules, solving combinatorial problems, proving identities.

Activities to be given:

- Practice using sum and product rules in counting principles.
- Apply binomial and multinomial theorems to solve related problems.

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 K Levels)
CO1	Understand the concepts of sum and Product	Up to K4
CO2	Determine Permutation and Combination	Up to K4
CO3	Determine the concept of Pascal's and Vander Monde's Identity	Up to K4
CO4	Understand the concept of Ramsey Numbers	Up to K5
CO5	Determine the numbers of Catalan, Stirling and Bell	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	2	2	-
CLO2	3	3	2	3	3	-
CLO3	3	3	1	2	3	-
CLO4	3	2	2	1	2	-
CLO5	3	3	3	3	3	-

1. Basic level**2. Intermediate level****3. Advanced level****Lesson plan:**

Unit	Description	Hours	Mode
I	The Rules of Sum and Product	6	Chalk & Talk and PPT
II	Permutations - Combinations - Permutations and Combinations with Repetitions	6	Chalk & Talk and PPT
III	The Binomial Theorem - Pascal's Identity - Vander Monde's Identity	6	Chalk & Talk and PPT
IV	The Multinomial Theorem - Ramsey Number	6	Chalk & Talk and PPT
V	The Catalan Numbers - Stirling Numbers and Bell Numbers	6	Chalk & Talk and PPT
		Total	30 Hours

Course Designer: T.Thivya