SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

(AUTONOMOUS)

(Affiliated to Bharathidasan University)

(Accredited by NAAC; An ISO 9001:2015 Certified Institution)

SUNDARAKKOTTAI, MANNARGUDI–614016.

TAMILNADU, INDIA.

M.Sc., MATHEMATICS COURSE STRUCTURE UNDER CBCS

(For the candidates admitted in the academic year 2022–2023)

ELIGIBILITY: Candidates who have passed Bachelor level Examination in Mathematics.

Sem.	Course	Course Code	Course Title	Ins. Hrs. / Week	Credit	Exam Hrs.	Marks		Total
							Int.	Ext.	
I	Core Course (CC) – I	22PMA101	Algebra	6	5	3	25	75	100
	Core Course (CC)– II	22PMA102	Real Analysis	6	5	3	25	75	100
	Core Course (CC)– III	22PMA103	Ordinary Differential Equations	6	4	3	25	75	100
	Core Course (CC)–IV	22PMA104	Mathematical Methods	6	4	3	25	75	100
	Elective Course (EC)– I		Fuzzy Sets and Their Applications / Tensor Analysis & Special Theory of Relativity	6	4	3	25	75	100
	Value Added Course(VAC)-I			-	2*	3	25	75	100*
	TOTAL			**30**	**22**				**500**
II	Core Course (CC)– V	22PMA205	Complex Variable	6	5	3	25	75	100
	Core Course (CC)– VI	22PMA206	Topology	6	5	3	25	75	100
	Core Course(CC) – VII	22PMA207	Graph Theory	6	5	3	25	75	100
	Core Practical(CP) – I	22PMA208P	Graph Theory with GRIN(P)	3	3	3	40	60	100
	Elective Course (EC)– II		Numerical Analysis / Mathematical Modelling	6	4	3	25	75	100
	Extra Disciplinary Course (EDC)– I			3	2	3	25	75	100
	TOTAL			**30**	**24**				**600**
III	Core Course (CC)– VIII	23PMA309	Functional Analysis	6	5	3	25	75	100
	Core Course (CC)–I X	23PMA310	Linear Algebra	6	5	3	25	75	100
	Core Course (CC)– X	23PMA311	Research Methodology	6	5	3	25	75	100
	Core Practical(CP) –II	23PMA312P	Optimization Techniques with Microsoft Excel and Solver(P)	3	3	3	40	60	100
	Elective Course(EC) – III	23PMAE3A /23PMAE3B	Optimization Techniques/Stochastic Processes	6	4	3	25	75	100
	Extra Disciplinary Course (EDC)– II			3	2	3	25	75	100
	TOTAL			**30**	**24**				**600**
IV	Core Course (CC)– XI	23PMA413	Differential Geometry	6	5	3	25	75	100
	Core Course (CC)– XII	23PMA414	Partial Differential Equations	6	5	3	25	75	100
	Entrepreneurship/Industry Based Course	23PMAI41	Latex	6	5	3	25	75	100
	Core Course (CC)– XIII	23PMAPW	Project	12	5	-	-	-	100
	Value Added Course(VAC)-II	23PMAVA42		-	2*	3	25	75	100*
	TOTAL			**30**	**20**				**400**
	GRAND TOTAL			**120**	**90**				**2100**

CURRICULUM DESIGN

Courses	No. of Courses	Total Credits
Core Courses	12	58
Core Practical	2	06
Elective Courses	3	12
Extra Disciplinary Courses	2	04
Project	1	05
Entrepreneurship/Industry Based Course	1	05
Total	**21**	**90**

Note:

1. Theory Internal 25 marks External 75 marks
2. Practical 40 marks 60 marks
3. Separate passing minimum is prescribed for Internal and External

a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10marks)

b) The passing minimum for University Examinations shall be 40% out of 75marks (i.e. 30marks)

c) The passing minimum not less than 50% in the aggregate.

ELECTIVE COURSES OFFERED BY THE DEPARTMENT

S.No.	Course Code	Semester	Elective Courses (EC) (Any one from the list)
1	22PMAE1A	I	Fuzzy Sets and Their Applications
2	22PMAE1B	I	Tensor Analysis & Special Theory of Relativity
3	22PMAE2A	II	Numerical Analysis
4	22PMAE2B	II	Mathematical Modelling
5	23PMAE3A	III	Optimization Techniques
6	23PMAE3B	III	Stochastic Processes

EXTRA DISCIPLINARY COURSES (EDC) OFFERED BY THE DEPARTMENT

S.No.	Course Code	Semester	Extra Disciplinary Courses (EDC) (Any one from the list)
1	22PMAED1A	II	Basic Mathematics-I
2	22PMAED1B	II	Operations Research
3	23PMAED2A	III	Basic Mathematics-II
4	23PMAED2B	III	Graph Theory and its Applications

VALUE ADDED COURSES OFFERED BY THE DEPARTMENT

S.No.	Course Code	Semester	Value Added Course
1	22PMAVA11	I	Mathematical Reasoning and Mental Ability
2	23PMAVA42	IV	Teaching & Research Aptitude

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TAMILNADU, INDIA.

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

(For the candidates admitted in the academic year2021–2022)

Question Paper Pattern- (Theory)

Max time: 3 Hours **Max Marks: 75**

Section – A (10 x 2 = 20)
Answer all the questions
Answer in One or Two sentences each

1.
2. UnitI
3.
4. UnitII
5.
6. Unit III
7.
8. Unit IV
9.
10. UnitV

Section – B (5 x 5 = 25)
Answer all the questions
Each answer should not exceed 500 words

11. a(or)
    b UnitI
12. a(or)
    b UnitII
13. a(or)
    b UnitIII
14. a(or)
    b UnitIV
15. a(or)
    b UnitV

Section–C (3x10=30)
Answer any <u>THREE questions</u> in 1200 words

16. UnitI
17. Unit II
18. UnitIII
19. UnitIV
20. UnitV

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(For the Candidates admitted in the academic year 2022 – 2023)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III -CC- VIII: Functional Analysis

Ins. Hrs./Week: 6 **Course Credit**: 5 **Course Code**: 23PMA309

UNIT- I: Banach Spaces (20 Hours)

Normed Linear spaces- Definitions and properties – Examples of Banach Spaces – Quotient Spaces – Direct Sum of Subspaces – Continuous Linear Transformations- Continuous Linear Functionals - Introduction – Representation theorems for Functionals - The Hahn-Banach Theorem

UNIT –II: Continuous Linear Functionals (18 Hours)

Some consequences of the Hahn-Banach Theorem – The Uniqueness of Extension- The Conjugate Space of C[a, b] – The Natural embedding of N in N^{**}.

Bounded Linear Operators

Introduction – The Open Mapping Theorem – An Application of the Banach's theorem - The Closed Graph Theorem – The Banach - Steinhaus Theorem

UNIT –III: Hilbert Spaces (16 Hours)

Introduction – Definitions and Examples – Hilbert Space and its basic properties – Applications of the Parallelogram law - Orthogonal Complements – The Orthogonal Decomposition Theorem – Orthonormal Sets – Complete Orthonormal Sets.

UNIT- IV: Operators on Hilbert Spaces (17 Hours)

Introduction – The Adjoint Operator – Self-adjoint Operators – Normal Operators – Unitary Operators – Projection Operators.

UNIT –V : Spectral Theory (19 Hours)

Introduction – Linear Operators and Matrices on a finite dimensional Hilbert Space – Spectrum of an operator on a finite dimensional Hilbert Space H –The Finite Dimensional Spectral Theorem – Compact Operators.

Total Lecture Hours- 90

COURSE OUTCOME

The students should be able to

1. Recognize the fundamental properties of normed spaces and the transformations between them.
2. Understand the central concepts from functional analysis.
3. Understand the Open Mapping Theorem and the Closed Graph Theorem.
4. Predict the main properties of bounded operators of Hilbert spaces.
5. Understand the notion of Hilbert Spaces and apply the spectral theorem to the resolution of integral equations.

TEXT BOOKS

1. Somasundaram.D. 2006. A First Course in Functional Analysis, Narosa Publishing House Pvt. Ltd., New Delhi.

UNIT - I Chapter 1 : Sec. 1.5 to 1.9
Chapter 2 : Sec. 2.1 to 2.4
UNIT –II Chapter 2 : Sec. 2.5 to 2.8
Chapter 3 : Sec. 3.1 to 3.5

UNIT- III Chapter 4 : Sec. 4.1 to 4.8
UNIT - IV Chapter 5 : Sec. 5.1 to 5.6
UNIT- V Chapter 6 : Sec. 6.1 to 6.5

REFERENCE BOOK(S)

1. Laurent Schwarz. 1964. Functional Analysis, Courant Institute of Mathematical Sciences, University, New York.
2. Limaye.B.V.1985. Functional Analysis, Wiley Eastern Limited, second print, Bombay.
3. Simmons.G.F.1963. Introduction to Topology and Modern Analysis, MC Graw-Hill Publishing Company Limited, New Delhi.
4. Walter Rudin. 1974. Functional Analysis, TMH Edition. MC Graw Hill, New York.
5. Yosida.K. 1974. Functional Analysis, Springer- Verlag, London.

E-RESOURCES

1. http://www.math.nsc.ru/LBRT/g2/english/ssk/fa_e.pdf
2. https://www.maths.usyd.edu.au/u/athomas/FunctionalAnalysis/daners-functional-analysis-2017.pdf
3. https://people.math.ethz.ch/~salamon/PREPRINTS/funcana.pdf
4. https://www.maths.lancs.ac.uk/~belton/www/notes/fa_notes.pdf
5. https://59clc.files.wordpress.com/2012/08/functional-analysis-_-rudin-2th.pdf

SENGAMALA THAYAAR EDUCATIONAL TRUST WOMEN'S COLLEGE

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SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2022 – 2023)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III -CC- IX: Linear Algebra

Ins. Hrs./Week: 6 **Course Credit**:5 **Course Code**: 23PMA310

UNIT I **(20 Hours)**

Matrices: Fields-Systems of linear Equations - Matrices and Elementary Row operations -Row- reduced echelon Matrices - Matrix Multiplication-Invertible Matrices–Vector Spaces-subspaces (Only Revision of Vector spaces and subspaces)

UNIT II **(18 Hours)**

Vector Spaces: Bases and Dimension-Co-ordinates Linear transformations: The algebra of linear transformations - Isomorphism of Vector Spaces - Representations of Linear Transformations by Matrices - Linear Functionals.

UNIT III **(16 Hours)**

Linear Transformations : The Double Dual - The Transpose of a Linear Transformation. Algebra of polynomials: The algebra of polynomials - Lagrange Interpolation - Polynomial Ideals -The prime factorization of a polynomial.

UNIT IV **(17 Hours)**

Elementary Canonical Forms: Characteristic values - Annihilating polynomials - Invariant subspaces.

UNIT V **(19 Hours)**

Diagonalization: Simultaneous triangulation and simultaneous Diagonalization Direct-sum Decompositions - Invariant Direct sums – Primary Decomposition theorem.

Total Lecture Hours- 90

COURSE OUTCOME :

The students should be able to

1. Understand various aspects of linear algebra.
2. Demonstrate Matrices, linear transformation and Determinants.
3. Apply the computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, vector spaces, eigenvalues and eigenvectors, orthogonality and diagonalization.
4. Analyze and construct mathematical arguments that related the study of introductory linear algebra.
5. Attain mathematical understanding and to formulate and solve problems and present solutions (Collaborative Skills)

TEXT BOOK(S) :

1. Kenneth Hoffmanand Ray Alden Kunze, Linear Algebra, Second Edition, Prentice Hall of India Private Limited, New Delhi,2005.

UNITI	Chapter 1 & 2: Sec 1.1 to 1.6 and 2.1,2.2
UNITII	Chapter 2 &3: Sec 2.3, 2.4 and 3.1 to3.5
UNITIII	Chapter 3 & 4: Sec 3.6, 3.7 and 4.1 -4.5
UNITIV	Chapter 6: Sec 6.1 -6.4
UNITV	Chapter 6: Sec 6.5 -6.8

REFERENCE BOOK(S) :

1. S. Kumaresan, Linear Algebra: A Geometric Approach, Prentice-Hall of India Ltd, 2004.
2. V.Krishnamurthy, V.P.Mainra,J.L.Arora, Introduction to Linear Algebra, East West Press Ltd, 1985.
3. A.R. Rao, P. Bhimashankaram, Linear Algebra, Second Edition, Tata McGraw Hill,2000.

E_RESOURCES :

1. https://www.freebookcentre.net/Mathematics/Linear Algebra-Books-Download.html
2. http://joshua.smcvt.edu/linearalgebra/book.pdf
3. https://math.mit.edu/~gs/linearalgebra
4. http://linear.ups.edu/
5. https://open.umn.edu/opentextbooks/textbooks/

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III-CC-X: Research Methodology

Ins. Hrs./Week: 6 **Course Credit**: 5 **Course Code**: 23PMA311

UNIT I : Research Ethics (18 Hours)

Philosophy-Definition,Nature,Scope and concept.Ethics -Definition,Moral Philosophy,Nature of Moral Judgements and reactions.Ethics with respect to science and research-Scientific misconducts-Falsification-Fabrication and Plagiarism-Use of Plagiarism Software-Turnitin,urkund and other open source software tools.Redundant Publications-duplicate and overlapping Publication.Publication ethics-definition and importance.Publication misconduct-definition,concept,problems that lead to unethical behaviour,types,violation of publication ethics,authorship and contributor ship.Software tool to identify predatory publications developed by SPPU.Subject specific ethical issues-authorship,conflicts of interest

UNIT II Introduction to Research Methodology (18 Hours)

Meaning of Research - Objectives of Research - Types of Research - Research Approaches - Significance of Research - Research Methods versus Methodology

UNIT III : Defining the Research Problem (17 Hours)

Research Problem - Selecting the Problem - Necessity of Defining the Problem - Technique Involved in Defining a Problem - An Illustration – Conclusion

UNIT IV : Data Collection (19Hours)

Introduction – Experiments and Surveys - Collection of Primary Data - Difference between Questionnaire and Schedule –Guidelines for constructing Questionnaire/Schedule - Some Other Methods of Data Collection - Collection of Secondary Data – Selection of Appropriate Method for Data Collection – Case Study Method

UNIT V: Interpretation and Report Writing (18 Hours)

Meaning of Interpretation - Techniques of Interpretation - Precautions in Interpretation - Significance of Report Writing - Different Steps in Writing Report - Layout of the Research Report - Types of Reports

Total Lecture Hours- 90

COURSE OUTCOME

The students Should be able to

1. Recognize the research ethics easily.
2. Demonstrate research activities for their academic and professional levels.
3. Create novel ideas and simple techniques useful to society.
4. Acquire background knowledge in research publication and thesis writing
5. Understand the steps in report writing

TEXT BOOKS

1.C.R.Kothari , Gaurav Garg , Research Methodology : Methods and Techniques (Third Edition), New Age International Publishers, New Delhi, 2014.

REFERENCE BOOK(S)

1. Deepak Chawla, Neena Sondhi, Research Methodology Concepts and Cases, Vikas Publishing House Pvt. Ltd, New Delhi, 2011.
2. R. Panneerselvam, Research Methodology, Prentice Hall of India Private Limited, New Delhi, 2007.
3. Yogesh Kumar Singh, Fundamental of Research Methodology & Statistics, New Age International Publishers, 2006.
4. Dr. Jayanta Kumar Nayak, Dr. Priyanka Singh, Fundamentals of Research Methodology, SSDN Publishers & Distributors, New Delhi, 2015.
5. Ranjit Kumar, Research Methodology, Sage Publishers India Pvt. Ltd., 2018.

E_RESOURCES :

1. https://www.tandfonline.com/doi/abs/10.2753/MIS0742-1222240302
2. https://www.cusb.ac.in/images/cusbfiles/2020/el/cbs/MCCOM2003C04%20(Business%20Research%20Methods)Research_Me__thodology_C_R_Kothari.pdf
3. http://www.ihmgwalior.net/pdf/research_methodology.pdf
4. https://collegetutor.net/notes/Research_Methodology_Notes_All_Units_-_Jatin
5. http://www.sociology.kpi.ua/wp-content/uploads/2014/06/Ranjit_Kumar-Research_Methodology_A_Step-by-Step_G.pdf

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III -CP- II: Optimization Techniques with Microsoft Excel and Solver

Ins. Hrs. / Week : 3 **Course Credit: 3** **Course Code : 23PMA312P**

LIST OF PRACTICALS

1. To Formulate and Solve Linear Programming Problems using solver.
2. To Formulate and Solve Integer Programming Problems using solver.
3. To Formulate and Solve Transportation Problems using solver.
4. To Formulate and Solve Assignment Problems using solver.
5. To Formulate and Solve Simulation Problems using solver.
6. To Formulate and Solve Inventory Problems using solve.
7. To Formulate and Solve Queuing problems using solver.

COURSE OUTCOME

The students should be able to

1. Discuss the features of Excel solver as a Modeling tool.
2. Manipulate with all the features of Excel solver.
3. Develop programming skills and technique to solve mathematical problems.
4. Apply the feature effectively in various problems in operation research.
5. Operate the Microsoft Excel solver as a simulation tool.

REFERENCE BOOK(S)

1. David R. Anderson and Dennis J.Seeny et al. 2012. An Introduction to Management Science, 13th Edition. South-Western Cengage Learning, USA.
2. Frederick S. Hillier and Mark S. Hillier. 2012. An Introduction to Management Science. 5th Edition. McGraw-Hill/Irwin Publishers, New York.
3. Hamdy A. Taha. 2017. Operations Research: An Introduction. 10th Edition. Pearson Prentice Hall Publishers. New Jersey.
4. Kanti Swaroop et al. 2019. Operations Research-Introduction to Management Science, 7th Edition. Sultan Chand & Sons, New Delhi.
5. Wayne L.Winston and Christian Albright S. 2009. Practical Management Science. 3rd Edition. South-Western Cengage Learning, USA.

E-RESOURCES

1. https://easyengineering.net/power-plant-engineering-by-a-k-raja/https://ebooks.lpude.in/commerce/bcom/term_5/DCOM303_DMGT504_OPERATION_RESEARCH.pdf
2. https://thalis.math.upatras.gr/~tsantas/DownLoadFiles/Taha%20-%20Operation%20Research%208Ed.pdf
3. https://www.excel-easy.com/data-analysis/solver.html
4. https://www.solver.com/solver-tutorial-using-solver

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DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester : III EC –III(1) : Optimization Techniques

Ins. Hrs./Week: 6 **Course Credit**: 4 **Course Code**: 23PMAE3A

UNIT- I : Integer Programming **(18 Hours)**

Introduction- Pure and Mixed Integer Programming Problem – Gomary's all Integer Programming Method – Construction of Gomary's Constraints - Fractional cut Method - Mixed Integer Programming Problems - Branch and Bound method.

UNIT –II : Dynamic Programming **(18 Hours)**

Introduction – Principle of Optimality - The recursive Equation approach – Characteristics of dynamic Programming - Dynamic Programming algorithm - Solution of Linear Programming Problem by Dynamic Programming.

UNIT–III :Inventory Control **(17 Hours)**

Introduction – Types of inventories - Reasons for carrying inventories - Inventory decisions – objectives – Cost associated with inventories - Factors affecting inventory control - An inventory control problem – Concept of EOQ - Deterministic inventory problem with no shortages - Deterministic inventory problem with shortages.

UNIT–IV :Queueing Theory **(17 Hours)**

Introduction-Queueing System-Elements of a Queueing System-Operating Characteristics of Queueing System-Probability Distributions -Classification of Queueing Models-Transient and steady state -Poisson queueing Systems(Model I,III only)

UNIT–V : Non- Linear Programming **(20 Hours)**

Introduction-Formulating a Non -Linear Programming problem (NLPP)-General NLPP - Constrained Optimization with Equality Constraints-Constrained Optimization with inequality Constraints-Quadratic Programming-Separable Convex Programming

Total Lecture Hours- 90

COURSE OUTCOME

The students should be able to

1. Gain knowledge about solving integer linear programming Problems.
2. Understand the concept of Dynamic Programming.
3. Analyze the concept ofInventory Models
4. Examine the concept of Queueing Theory.
5. Apply the concept of NLPP in Research.

TEXT BOOKS

1. Kanti Swarup, P.K.Gupta and ManMohan. 2007. Operations Research, Thirteenth Edition. Sultan Chand & Sons, New Delhi.

UNIT-I Chapter - 7 : Sec.7.1 to 7.7
UNIT-II Chapter - 13 (Omit 13.5 &13.6)
UNIT- III Chapter -19 : Sec. 19.1 to19.11
UNIT-IV Chapter - 21 : Sec 21.1 to 21.9
UNIT-V Chapter -27 : Sec 27.1to 27.5
Chapter -28 : Sec 28.4 & 28.7

REFERENCE BOOK(S)

1. Eiselt H.A. and Sandblom C.L. 2010. Operations Research. Springer Verlag Berlin Herdelberg, New York.
2. Hamdy A. Taha. Operations Research, 7th Edition. Prentice Hall of India Pvt. Limited, New Delhi.
3. Prem Kumar Gupta and Hira.D.S, 2014. Operations Research, Seventh Edition. Sultan Chand, New Delhi.
4. Rama Muruthy P. 2007. Operation Research. New Age International Private Limited, Chennai.
5. Srinivasan G. 2017. Operation Research Principles and Applications, Third Edition. PHI Learning Pvt. Limited, New Delhi.

E-RESOURCES

1. https://www.bbau.ac.in/dept/UIET/EME-601%20Operation%20Research.pdf
2. https://www.google.co.in/books/edition/_/6khDDAAAQBAJ?hl=en
3. https://coral.ise.lehigh.edu/magh/present/stetson01.pdf
4. https://www.researchgate.net/publication/313880623_Introduction_to_Operations_ Research_Theory_ and_Applications
5. http://www.ru.ac.bd/stat/wpcontent/uploads/sites/25/2019/03/405_01_Srinivasan_ Operations- Research_Principles-and-Applications-Prentice-Hall-of-India-2010.pdf

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(For the Candidates admitted in the academic year 2022 – 2023)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: III-EC-III (2): STOCHASTIC PROCESSES

Ins. Hrs./Week: 6 **Course Credit**: 4 **Course Code**:23PMAE3B

UNIT –I: **(20 Hours)**

Stochastic Processes: Some notions – Specification of Stochastic processes – Stationary processes -Markov Chains : Definitions and examples – Higher Transition probabilities.

UNIT – II: **(18 Hours)**

Classification of states and chains – determination of Higher transition probabilities – stability of aMarkov system.

UNIT – III: **(18 Hours)**

Markov processes with Discrete state space : Poisson processes and their extensions – Poisson processand related distribution – Generalization of Poisson process- Birth and Death process.

UNIT – IV: **(18 Hours)**

Renewal processes and theory : Renewal process – Renewal processes in continuous time – Renewal equation – stopping time : Wald's equation – Renewal theorems.

UNIT – V: **(16 Hours)**

Stochastic processes in Queuing – Queuing system – General concepts – the queuing model M/M/1 Steady state Behaviour – transient behaviour of M/M/1Model.

Total Lecture Hours- 90

COURSE OUTCOME

The students should be able to

1.Understand the classification of stochastic processes and the idea of Markov chains in various field.

2.Understand the types of States, chains and communication relations

3.Understand the concept of Poisson processes and its properties

4.Understand the notions of renewal processes and renewal equations

5.Compute queuing model with its characteristics.

TEXT BOOK

1.J. Medhi, Stochastic Processes, Second edition, New Age International Publishers, NewDelhi,1981.

UNIT I : Chapter II &III: Sec 2.1 to 2.3 & 3.1, 3.2

UNIT II : Chapter III : Sec 3.4 to 3.6

UNIT III : ChapterIV : Sec 4.1 to 4.4

UNIT IV : ChapterVI : Sec 6.1 to 6.5

UNIT V : ChapterX : Sec 10.1 to 10.3

REFERENCE BOOK(S) :

1.SamuelKarlin, Howard M. Taylor, A first course in stochastic processes, Academic press, SecondEdition,1975. 2.NarayanBhat, Elements of Applied Stochastic Processes, John Wiley,1972.

E_RESOURCES :

1.https://www.kent.ac.uk/smsas/personal/lb209/files/sp14.pdf

2.https://bookboon.com/en/stochastic-processes-2-ebook

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(For the Candidates admitted in the academic year 2022 – 2023)

DEPARTMENT OF MATHEMATICS

Semester: III-EDC-II (1) : Basic Mathematics - II

Ins. Hrs./Week : 3 **Course Credit** : 2 **Course Code**: 23PMAED2A

UNIT –I **(9 Hours)**

Relationship or Analogy test

UNIT –II **(8 Hours)**

Series Completion Test

UNIT – III **(9 Hours)**

Coding and Decoding Test

UNIT – IV **(10 Hours)**

Problems based on Alphabet

UNIT – V **(9 Hours)**

Assigning Artificial values to Arithmetical Digits and Signs

Total Lecture Hours- 45

COURSE OUTCOME

The students should be able to

1. Equip themselves with a skill to prepare for Competitive Exams related to UGC, NET,Civil Services, Bank, Railway LIC etc.,.
2. Solve the problems of Series Completion Test.
3. Understand the Coding and Decoding Test
4. Solve the Problems based on Alphabet
5. Analyze the Assigning Artificial values to Arithmetical Digits and Signs

TEXT BOOKS

1. Dr.Lal, Jain & Dr.K.C.Vashistha. 2012. Teaching & Research Aptitude Upkar Prakashan,Agra-2.

UNIT-I Chapter 1
UNIT-II Chapter 3
UNIT–III Chapter 4
UNIT- IV Chapter 7
UNIT-V Chapter 14

REFERENCE BOOK(S)

1. Aggarwal R.S. 2017. Quantitative Aptitude for Competitive Examinations. S.Chand, NewDelhi.
2. Avani Madasamy. 2018. Way to Success, Avvai Publications, Madurai.
3. Abhijit Guha. 2011. Quantitative Aptitude for Competitive Examinations, Fourth Edition.Tata McGraw Hill Education Private Limited, New Delhi.
4. Madaan.K.V.S. 2021. UGC-Teaching and Research Aptitude, Fifth Edition. PearsonPublication, New York.
5. Harpreet Kaur. 2019. UGC-Teaching and Research Aptitude, Second Edition. OxfordUniversity Press, Chennai.

E_RESOURCES

1. **https://www.competitiveexambook.com/2019/08/Kiran-Publication-all-ebook-free-download.html**
2. **https://www.pdfdrive.com/quantitative-aptitude-and-reasoning-d187540802.html**
3. **https://ugcnetpaper1.com/ugc-net-paper-1-study-material-pdf**
4. **file:///C:/Users/Admin/Downloads/MC%20Question_Solution%20Ch%2005.01%20 Background%20of%20Interpolation.pdf.**
5. **https://www.examsbook.com/mathematical-reasoning-questions-with-answers-for-competitive-exams**

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DEPARTMENT OF MATHEMATICS

Semester: III- EDC-II(2) : Graph theory and its Applications

Ins. Hrs./Week: 3 **Course Credit**: 2 **Course Code**: 23PMAED2B

UNIT- I : Introduction and Path and Circuits (**9 Hours)**

Graph - Application of Graphs - Finite and Infinite Graphs - Incidence -Degree-Isolated Vertex- Pendent Vertex - Null Graph – Isomorphism - Subgraphs – Walks- Path-Circuits - Connected Graphs-Disconnected Graphs and Components - Euler Graphs.

UNIT-II: Path and Circuits **(8 Hours)**

Operation on Graphs -Definition for Decomposition-Deletion -Fusion - More on Euler Graphs and theorem-Arbitrarily Traceable Graphs - Hamiltonian Circuits - Hamiltonian Path -Complete Graph and Theorem.

UNIT –III: Trees and Fundamental Circuits **(10 Hours)**

Trees - Some properties of Trees - Pendant Vertices in a Tree - Distance and Centers in a Tree – Cuts-Sets - Some Properties of a cut-set - All cut-sets in a graph - Fundamental Circuits and Cut-sets - Connectivity and Separability.

UNIT- IV: Matrix Representation of Graph **(9 Hours)**

Incidence Matrix-Circuit matrix - Fundamental Circuit Matrix and Rank of B - Cut -Sets Matrix - Adjacency Matrix.

UNIT –V: Directed Graphs **(9 Hours)**

Introduction - Definition and Basic Properties - Some Applications-Connecter Problem - Kruskal's Algorithm- Shortest Path Problem - Dijkstra's Algorithm.

Total Lecture hours-45

COURSE OUTCOME

The students should be able to

1. Recognize the use of graphs and their applications.
2. Identify Hamiltonian Paths and Circuits in the graphs.
3. Solve problems using basic Fundamental circuit & Cut Sets.
4. Understand the concept of matrix representation of graphs
5. Apply the graph theory in modern real world problems.

TEXT BOOKS

1. Narsingh Deo. 2011. Graph Theory with applications to Engineering and Computer Science, PHI Learning PVT. Ltd, New Delhi.
2. Arumugam. S and Ramachandran. S. 2006. Invitation to Graph Theory, SciTech Publications (India) PVT. Ltd., Chennai.

UNIT-I Chapter 1 : Sec. 1.1 to1.5 &
Chapter 2 : Sec. 2.1, 2.2, 2.4 to 2.6 of [1]
UNIT-II Chapter 2 : Sec.2.7 to 2.9 of [1]
UNIT-III Chapter 3 : Sec. 3.1 to 3.4&
Chapter 4 : Sec. 4.1 to 4.5of [1]
UNIT-IV Chapter 7 : Sec. 7.1 to 7.4, 7.6, 7.9 of [1]
UNIT-V Chapter 10 : Sec. 10.0, 10.1&
Chapter 11 : Sec 11.0, 11.1, 11.2 of [2

REFERENCE BOOK(S)

1. Balakrishnan. V.K.1997.Theory and problems of Graph Theory. MC Graw Hill Education (India) PVT. New Delhi.
2. Gary Chartrand and Ping Zhang, 2004.Introduction to Graph Theory, Tata McGraw Hill Edition.India.
3. Gary Chartrand, Linda Lesniak and Ping Zhang. 2016. Graphs and Diagraphs, CRC Press, United States
4. Jonathan L., Jay Yellen and Mark Anderson, 2019. Graph Theory and its Application, Third Edition. CRC Press, United States.
5. Richard J. Treduea. 1993. Introduction to Graph Theory. Dover Publications, New York.

E-RESOURCES

1. http://empresa.bellarica.org
2. http://math.stackexchange.com
3. http://www.nrce.niepa.ac.in
4. http://meskc.ac.in
5. http://www.goodreads.com

SENGAMALA THAYAAR EDUCATIONALTRUST WOMEN'S COLLEGE

(AUTONOMOUS)

SUNDARAKKOTTAI, MANNARGUDI- 614016

(For the Candidates admitted in the academic year 2022 – 2023)

DEPARTMENT OF MATHEMATICS

M.Sc., MATHEMATICS

Semester: IV- CC-XI : Differential Geometry

Ins. Hrs./Week: 6 **Course Credit**: 5 **Course Code**: 232PMA413

UNIT-I: Theory of space curve **(20 Hours)**

Introduction to space curves-Representation of space curves-Unique parametric representation of a space curves-Definitions and some basic examples-Arc length-Tangent and osculating plane - Principle normal and binormal -Curvature and torsion -Curvature and Torsion of a curve as the intersection of two surfaces-Contact between curves and surfaces.

UNIT-II: Tangent Surfaces **(20 Hours)**

Introduction to Tangent surfaces- Involutes and evolutes-Definitions and theorems- Intrinsic equation of space curves - Definition & Examples-Fundamental existence theorem for space curves –Theorem & examples -Helices-Theorem on characterises of cylindrical helices - Spherical helix.

UNIT-III : First fundamental form of a surface **(19 Hours)**

Introduction to Metric on a surface - First fundamental form –Definitions & examples - Direction coefficients of a surface- Theorems and examples -Families of curves - Orthogonal trajectories - Double family of curves -Isometric correspondence.

UNIT-IV: Geodesic on a surface **(16 Hours)**

Introduction to Geodesic-Geodesic and their differential equations-Theorems and examples-Canonical Geodesic equations-Geodesics on surface of revolution-Geodesic curvature-Definitions and theorems - Gauss- Bonnet theorem-Gaussian Curvature - Surfaces of constant curvature.

UNIT-V: Second fundamental form of a surface **(15 Hours)**

Introduction to Second fundamental form-Definitions and theorems-Classification of points on a surface - Principle curvatures-Lines of curvatures - Developable surfaces-Edge of regression -Developable associated with space curves- Developable associated with curves on surface.

Total Lecture Hours- 90

COURSE OUTCOME

The students should be able to

1. Obtain the knowledge about basic properties of arc length, principal normal.
2. Determine the intrinsic equation of space curves and helices.
3. Develop the concept of first fundamental form and orthogonal trajectories.
4. Recognize geodesics and surfaces of constant curvature.
5. Understand the concept of developable surfaces.

TEXT BOOK(S)

1. Somasundaram D. 2008. Differential Geometry A First Course. Narosa Publishing house, New Delhi.

UNIT- I Chapter 1 : Sec.1.1 to 1.7, 1.9, 1.10
UNIT- II Chapter 1 : Sec.1.13, 1.16 to 1.18
UNIT -III Chapter 2 : Sec.2.9 to 2.14
UNIT -IV Chapter 3 : Sec.3.2, 3.10 to 3.13
UNIT- V Chapter 4 : Sec. 4.2, 4.4, 4.5, 4.7 to 4.9

REFERENCE BOOK(S)

1. Jain.S.K.2002. Differential geometry, Ivy publishing house, New Delhi.
2. Pressley. A. 2005. Elementary Differential Geometry, Springer International Edition. Verlog, London.
3. Thorpe. J. A. 1979. Elementary topics in Differential Geometry, Springer Publishers, New York.
4. Weatherbun. C. E. 2016. Differential Geometry of three dimensions, Cambridge University Press, India.
5. Willmore. T. J. 2002. Introduction to Differential Geometry, Oxford University Press, New Delhi.

E- RESOURCES

1. https://www.scribd.com/document/398285043/Differential-Geometry-A-First-Course-pdf
2. http://www.freebookcentre.net/Mathematics/Differential-Geometry-Books.html
3. https://www.mat.univie.ac.at/~michor/dgbook.pdf
4. https://people.math.ethz.ch/~salamon/PREPRINTS/diffgeo.pdf
5. http://etananyag.ttk.elte.hu/FiLeS/downloads/_01_Csikos_Differential_geometry.pdf

SENGAMALA THAYAAR EDUCATIONALTRUST WOMEN'S COLLEGE

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(For the Candidates admitted in the academic year 2022 – 2023)

DEPARTMENT OF MATHEMATICS

M.Sc.,MATHEMATICS

Semester: IV- CC-XII : Partial Differential Equations

Ins. Hrs./Week: 6 **Course Credit**: 5 **Course Code**: 23PMA414

UNIT- I : Partial Differential Equations of the first order **(20 Hours)**

Partial Differential Equations- Origins of first order Partial differential equations- Cauchy's problem for first order equations- Linear equations of the first order - Integral surfaces Passing through a given curve - Surfaces Orthogonal to a given system of surfaces.

UNIT-II: Partial Differential Equations of the first order **(20 Hours)**

Cauchy's Method of Characteristics- Compatible systems of first order equations- Charpit's Method- Special types of first order equations- Some Example problems - Solutions Satisfying Given Conditions- Jacobi's Method.

UNIT –III: Partial Differential Equations of the Second order **(16 Hours)**

The Origin of Second Order Equations -Linear Partial Differential Equations with Constant co-efficient - Some Theorems- Example problems - Equations with variable coefficients- Characteristic curves of second order equations.

UNIT- IV: Partial Differential Equations of the Second order **(18 Hours)**

Characteristics of equations in three variables- The solution of Linear Hyperbolic equations - Separation of variables - The method of Integral Transforms – Non-Linear equations of the second order.

UNIT –V: Laplace's Equation **(16 Hours)**

Elementary solutions of Laplace's equations- Examples Problems-Families of equipotential Surfaces- Boundary Value Problems-Separation of Variables -Kelvin's Inversion-The Theory of Green's Function of Laplace's equation.

Total Lecture Hours – 90

COURSE OUTCOME

The students should be able to,

1. Solve linear partial differential equations.
2. Match the information from partial derivative models to interpret reality.
3. Formulate appropriate numerical methods for solving various problems in PDE(Partial Differential Equations).
4. Analyze the fundamental principles of PDE to solve hyperbolic, parabolic and elliptic equations.
5. Apply PDE in scientific and research problems.

TEXT BOOK(S)

1. Ian N. Sneddon. 2006. Elements of Partial Differential Equations, Dover Publication –INC, NewYork..

UNIT - I Chapter 2 : Sec. 1 to 6
UNIT - II Chapter 2 : Sec. 8 to 13
UNIT - III Chapter 3 : Sec. 1,4 to 6
UNIT - IV Chapter 3 : Sec. 7 to 11
UNIT - V Chapter 4 : Sec. 2 to 5, 7 ,8

REFERENCE BOOK(S)

1. Bhargava and Chandramouli. 2015. Differential Equations, Prakashan Edition III. New Delhi.
2. Copson.E.T.1973. Partial Differential Equations, Cambridge University Press, London.
3. Raisinghania.M.D.1988.Advanced Differential Equations, S. Chand and Company Ltd, New Delhi.
4. Walter A. Strauss. 2007. Partial Differential Equations An Introduction, Brown University, Rhode Island.
5. Zachmanoglou E.C. and Dale W. Thoe. 1986. Introduction to Partial Differential Equations and its Applications, Dover Publications, New York.

E-RESOURCES

1. http://www.math.toronto.edu/ivrii/PDE-text Book/
2. https://math.stackexchange.com
3. http://www.nrce.niepa.ac.in
4. http://www.mathworks.com
5. http://ocw.mit.edu

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DEPARTMENT OF MATHEMATICS

ENTRENEURSHIP/ INDUSTRY BASED COURSE

LATEX

Ins. Hrs./Week: 6 **Course Credit**: 5 **Course Code**: 23PMAI41

UNIT- I: Installation of LaTeX (20 Hours)

Installation of Kile and MikeTeX - Class and packages - Latex programming and commands, sample packages - Error messages : Some sample errors, List of Latex error messages

UNIT- II: Formatting of output document (20 Hours)

Fonts, symbols, indenting, paragraphs, line spacing, word spacing, titles and subtitles - Document class, page style, parts of the documents, table of contents - Command names and arguments, environments, declarations - Theorem like declarations, comments within text

UNIT- III: Mathematical formulae (16 Hours)

Mathematical environments, math mode, mathematical symbols - Graphic package, multivalve functions, drawing matrices

UNIT- IV: Mathematical formulae (Cont..) (18 Hours)

Tables, tables with captions - References to figures and tables in text

UNIT- V: Drawing with LaTeX (16 Hours)

Picture environments - Extended pictures, other drawing packages - Preparing book, project report in LaTeX.

Total Lecture Hours-90

COURSE OUTCOME

The students will be able to

1. Type setting of complex mathematical formulae using LaTeX.
2. Use tabular and array environments within LaTeX.
3. Use various methods to either create or import graphics into a LaTeX document.
4. Typesetting of journal articles, technical reports, thesis, books, and slide presentations.
5. Automatic generation of table of contents, bibliographies and indexes.

TEXT BOOKS

1. Guide to LATEX, fourth edition, Helmut Kopka, Patrick W.Daly

REFERENCE BOOK(S)

1. Leslie Lamport, 1994, A document preparation system, User's guide and reference manual, 2nd edition, Addison Wesley.
2. Frank Mittelbach with Ulrike Fischer, 2023, The LaTeX Companion, 3nd edition (TTCT series), Addison-Wesley Professional.
3. Frank Mittelbach, Michel Goossens, Johannes Braams, David Carlisle, Chris Rowley, 2004, The LaTeX Companion, 2nd edition, Addison-Wesley Professional
4. Michel Goossens, Frank Mittelbach, Sebastian Rahtz, Denis Roegel, Herbert VoB, 2007, The LaTeX Graphics Companion, 2nd edition, Addison-Wesley Professional.
5. Michel Goossens, Sebastian Rahtz, 1999, The LaTeX Web Companion Integrating TeX, HTML and XML, Addison-Wesley Professional.

E_RESOURCES

1. https://homepages.inf.ed.ac.uk/imurray2/compnotes/latex.html
2. http://static.latexstudio.net/wp-content/uploads/2015/03/LaTeX_Beginners_Guide.pdf

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DEPARTMENT OF MATHEMATICS

VALUE ADDED COURSE - II

II PG, Semester: IV: Teaching & Research Aptitude

Ins. Hrs. 30 **Course Credit:** 2 **Course Code**: 23PMAVA42

UNIT- I:
Series Completion Test **(6 Hours)**

UNIT- II:
Coding and Decoding Test **(6 Hours)**

UNIT- III:
Problems based on Alphabet **(6 Hours)**

UNIT- IV:
Mathematical Ability Test **(6 Hours)**

UNIT- V:
Venn Diagram and Chart Type Test **(6 Hours)**

COURSE OUTCOME:

The students will be able to

1. Solve the Series Completion Problems easily.
2. Understand the Coding and Decoding Problems.
3. Solve the problems related to Alphabets.
4. Analyze the Mathematical Ability Test Problems.
5. Solve the problems on Venn Diagram and Chart Type Test.

TEXT BOOKS

1. UGC NET/JRF/SET TEACHING & RESEARCH APTITUDE By Dr. Lal, Jain & Dr. K. C. Vashistha

UNIT- I Chapter 3
UNIT- II Chapter 4
UNIT- III Chapter 7
UNIT-IV Chapter 9
UNIT-V Chapter 16

REFERENCE BOOK(S)

1. Dr.Kumar.A, CSIR-U.G.C. NET/JRF/SET Mathematical Sciences 2018, Upkar Prakashan, Agra- 2.
2. Showick Thorpe, Analytical Skills, SChand Publications.

3. Kundan.K, Advanced Verbal Reasoning, BSC Publishing.
4.Panel of Experts, MAT Multiple Choice Questions With Answer For Mathematical Skill, Faculty Notes.
5.Tyra.M, Quicker Maths, BSC Publishing.

E_RESOURCES

1. https://www.drnishikantjha.com/papersCollection/UGC%20NET%20.pdf
2. https://www.ascdegreecollege.ac.in/wp-content/uploads/2020/12/NET-UGC-Teaching-and-Learning-Aptitude-KVS-Madan.pdf

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