JAYARAJ ANNAPACKIAM COLLEGE FOR WOMEN (AUTONOMOUS)

A Unit of the Sisters of St. Anne of Tiruchirappalli

Accredited with 'A' Grade (3rd Cycle) by NAAC

DST FIST Supported College

Affiliated to Mother Teresa Women's University, Kodaikanal

PERIYAKULAM – 625 601, THENI DT. TAMIL NADU.

ACADEMIC COUNCIL

DEPARTMENT OF MATHEMATICS

09.09.2020

PG AND RESEARCH CENTRE OF MATHEMATICS

P.G. PROGRAMME OUTCOME

PO. NO	UPON COMPLETION OF THIS PROGRAM THE STUDENTS WILL BE ABLE TO
1.	Endow with in-depth knowledge, analyze and apply the understanding of their discipline for the betterment of self and society.
2.	Synthesize ideas from various disciplines, enhance the interdisciplinary knowledge and extend it for research.
3.	Gain confidence and skills to communicate orally/ verbally in research platforms and state a clear research finding.
4.	Develop problem solving and computational skills and gain confidence to appear the competitive examination.
5.	Enhance knowledge regarding research by accumulating practical knowledge in specific areas of research.
6.	Achieve idealistic goals and enrich the values to tackle the societal challenges.

P.G. PROGRAMME SPECIFIC OUTCOMES

PSO. NO.	UPON COMPLETION OF THE PROGRAM THE STUDENTS WILL BE ABLE TO	PO MAPPED
PSO-1	Solve complex mathematical problems using the knowledge of pure and applied mathematics	PO-1
PSO-2	Involve in research by incorporating the mathematical tools in science and technology	PO-5
PSO-3	Analyze and apply logical arguments to understand and apply mathematical concepts and techniques	PO-3
PSO-4	Model and solve real life problems using mathematical techniques and to develop scientific outlook in other disciplines	PO-4 PO-2
PSO-5	Interpret creatively the mathematical facts and figures to inculcate the individual scholarly research and to crack competitive examinations and procure their professional career	PO-1 PO-5 PO-6

P.G. COURSE PATTERN (2020 - 2023) (UGC/ TANSCHE/ MTU)

Sem.	Code	Title of the Course	Hours	Credit
I	20PMA1C01	Algebra – I	6	5
	20PMA1C02	Analysis – I	6	5
	20PMA1C03	Numerical Analysis	6	4
	20PMA1C04	Advanced Calculus	6	5
	20PMA1E1A/ 20PMA1E1B/ 20PMA1E1C	Cryptography/ Combinatorics/ Classical Mechanics	6	4
		Total	**30**	**23**
II	20PMA2C05	Algebra – II	6	5
	20PMA2C06	Analysis – II	6	5
	20PMA2C07	Mathematical Statistics	6	5
	20PMA2E2A/ 20PMA2E2B/ 20PMA2E2C	Optimization Theory/ Differential Geometry/ Graph Theory	6	4
	20PMA2GE1	IDC – MATLAB and LaTeX	4	3
	20PSE2S01	Soft Skills	2	1
		Total	**30**	**23**
III	20PMA3C08	Field Theory and Lattices	6	5
	20PMA3C09	Topology	6	5
	20PMA3C10	Complex Analysis	6	5
	20PMA3E3A/ 20PMA3E3B/ 20PMA3E3C	Stochastic Process/ Number Theory/ Calculus of Variations	6	4
	20PMA3GE2	IDC - Mathematical Skills	4	3
	20PSE3H02	Human Rights & Duties	2	1
	20PMA3IN1	Internship	-	2*
		Total	**30**	**23+2***
IV	20PMA4C11	Functional Analysis	6	5
	20PMA4C12	Differential Equations	6	5
	20PMA4C13	Operations Research	6	5
	20PMA4R01	Project	12	6
	20PMA4SM1	MOOC'S	-	1*
	20PMA4S01	Comprehensive Examination	-	2*
		Total	**30**	**21+3***
		Total for All Semesters	**120**	**90 + 5***

CONTINUOUS INTERNAL ASSESSMENT COMPONENT (CIA)

THEORY:

Component	Marks	Marks
Internal Test I	40	Converted to 25
Internal Test II	40	
Seminar	10	
Term Paper	5	
Attendance	5	
Total	**100**	**25**

CONTINUOUS INTERNAL ASSESSMENT COMPONENT (CIA)

Practical : 40 Marks

PASSING MINIMUM

Semester Examination	
Theory	50% out of 75 Marks (i.e. 37.5 Marks)
Practical	50% out of 60 Marks (i.e. 30 Marks)

PROJECT WORK

The ratio of marks for Internal and External Examination is 50:50

THE INTERNAL COMPONENTS OF PROJECTS

Components	Semester Examination
First Review	10
Second Review	10
Final Review(Internal Viva Voce)	30
Total	**50**

EXTERNAL VALUATION OF PROJECT WORK

Components	Marks
Project	25
External Viva Voce	25
Total	**50**

Internship Component can be decided by the respective Dept.

INTERNAL QUESTION PATTERN

(Maximum Marks-40)

PART - A

10 Questions × 1Mark = 10 Marks

PART - B

2 Questions × 5 Marks = 10 Marks

(Internal Choice and One Question from Each Unit)

PART - C

2 Questions × 10 Marks = 20 Marks

(Open Choice, Two Questions out of Three)

EXTERNAL QUESTION PATTERN

(Maximum Marks-75)

PART - A

10 Questions × 1Mark = 10 Marks

(Two Questions from each Unit)

PART - B

5 Questions × 5 Marks = 25 Marks

(Internal Choice and one set of Question from each Unit)

PART - C

5 Questions × 8 Marks = 40 Marks

(Open Choice Five Questions out of Seven

Atleast One Question from each Unit)

ALGEBRA-I

Semester: I **Hours: 6**
Code : 20PMA1C01 **Credit: 5**
COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Understand the concept of counting principles.	PSO - 1	K
CO – 2	Apply class equation and Sylow's theorem to solve different problems.	PSO - 3	Ap
CO – 3	Construct ideal rings from the fundamental concepts.	PSO –4	E
CO – 4	Utilize the results of Euclidian Ring to Gaussian integer.	PSO - 1	C,K
CO – 5	Identify the reducible and irreducible polynomials.	PSO-5	An, S

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : I				**ALGEBRA –I**							**Hours: 6**
Code : 20PMA1C01											**Credits: 5**
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	3	3	3	3	4	3	3	3	3	3.18
CO2	3	3	4	3	3	3	3	3	4	3	3	3.18
CO3	3	4	3	4	3	3	3	3	3	4	3	3.27
CO4	4	3	3	3	3	3	4	3	3	3	3	3.18
CO5	4	3	3	3	4	4	2	3	3	3	4	3.27
Overall Mean Score												**3.21**

Result: The Score for this Course is 3.21 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

Another Counting Principle - Cauchy theorem - Sylow's theorem-Second part of - Sylow's theorem-Third part of Sylow's theorem. **(18 Hours)**

UNIT II

Direct Products - External direct Product - Internal direct Product - Finite Abelian Groups - Every finite Abelian group is the direct product of cyclic groups.

(18 Hours)

UNIT III

Ideals and Quotient rings - More Ideals and Quotient rings - The Field of Quotients of an integral Domain. **(18 Hours)**

UNIT IV

Euclidean Rings - Definition-Principal Ideal Ring - Unique Factorization theorem -A Particular Euclidean Ring j[i] - Fermat theorem **(18 Hours)**

UNIT V

Polynomial Rings - Division Algorithm - Polynomial Rings over the Rational Field -Gauss' Lemma - The Eisenstein Criterion - Polynomial Rings over Commutative Rings. **(18 Hours)**

COURSE BOOK:

N. Herstein, Topics in Algebra (2nd Edition), John Wiley & Sons, 2012.

Unit I	**:**	Chapter 2 : sections 2.11, 2.12. (Theorem 2.12.1, Lemma 2.12.1 & 2.12.2 are omitted)
Unit II	**:**	Chapter 2 : sections 2.13, 2. 14
Unit III	**:**	Chapter 3 : sections 3.4, 3.5, 3.6
Unit IV	**:**	Chapter 3 : sections 3.7, 3.8
Unit V	**:**	Chapter 3 : sections 3.9 , 3.10 , 3.11

BOOKS FOR REFERENCE:

1. Surjeet Singh, Modern Algebra, Edition 7,Vikas Publishing House Pvt. Limited, 2005.
2. Vijay K. Khanna., & Bhambri, S. K. A Course in Abstract Algebra. (Fourth Edition). Vikas Publishing House Pvt. Ltd, 2013.

ANALYSIS - I

Semester: I **Hours: 6**

Code : 20PMA1C02 **Credits: 5**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO-1	Acquire basic knowledge of metric spaces and Euclidean spaces.	PSO -1	K
CO-2	Build a foundation for Topology.	PSO -5	S
CO-3	Understand the concepts of limits of sequences, series and functions.	PSO -1	K
CO-4	Determine the continuity of functions.	PSO -3	An
CO-5	Operate the extended real number system in terms of neighborhoods.	PSO–4	Ap

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : I				**ANALYSIS – I**							**Hours: 6**
Code : 20PMA1C02											**Credits: 5**
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	4	3	3	3	4	3	3	3	3	3.18
CO2	4	2	3	2	4	4	3	3	3	3	4	3.18
CO3	4	3	3	3	3	3	4	3	3	3	3	3.18
CO4	3	3	4	3	3	3	3	3	4	3	3	3.18
CO5	3	4	3	4	2	3	3	3	3	4	3	3.18
Overall Mean Score												**3.18**

Result: The Score for this Course is 3.18 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

Finite, countable and uncountable sets - Metric spaces - compact sets – Perfect sets - Connected sets. **(18 Hours)**

UNIT II

Numerical sequences and series - Convergent sequences - subsequences - Cauchy sequences - Upper and lower limits - Some special sequences - Series - Series of nonnegative terms. **(18 Hours)**

UNIT III

The number e - The root and ratio tests -Power series - Summation by parts - Absolute convergence - addition and multiplication of series - Rearrangements. **(18 Hours)**

UNIT IV

Continuity - Limits of functions - Continuous function - Continuity and compactness - Continuity and connectedness – Discontinuities - Monotonic functions - Infinite limits and limits at infinity. **(18 Hours)**

UNIT V

Differentiation - The derivatives of a real function - Mean value theorems – The continuity of derivatives - L' hospital's rule - Derivatives of higher order - Taylor's theorem - Differentiation of vector valued functions. **(18 Hours)**

COURSE BOOK:

Walter Rudin, Principles of Mathematical Analysis(Third Edition), McGraw - Hill International Book Company, International Student Edition), 1984.

Unit I	**:**	Chapter 2
Unit II	**:**	Chapter 3 Section 3.1 to 3.29
Unit III	**:**	Chapter 3 section 3.30 to 3.55
Unit IV	**:**	Chapter 4
Unit V	**:**	Chapter 5

BOOKS FOR REFERENCE:

1. Tom P. Apostol, Mathematical Analysis,Narosa Publishing House, New Delhi, 1985.
2. A. J. White, Real Analysis, An Introduction, Addison Wesley Publishing Co., Inc. 1968.

NUMERICAL ANALYSIS

Semester: I **Hours: 6**

Code : 20PMA1C03 **Credits: 4**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO-1	Perform an error analysis for various numerical methods.	PSO - 1	K,C
CO-2	Apply numerical methods to obtain approximate solutions to nonlinear equations.	PSO - 3	Ap
CO-3	Determine the intermediate values in tabulated data using interpolation.	PSO - 3	An, Ap
CO-4	Develop appropriate numerical methods to solve differential equations.	PSO - 5	S
CO-5	Evaluate differentials and integrals using different formulae.	PSO – 4	E

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : I				**NUMERICAL ANALYSIS**							**Hours: 6**
Code : 20PMA1C03											**Credits: 4**
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	3	3	3	3	4	3	3	3	3	3.18
CO2	3	3	4	3	3	3	3	3	4	3	3	3.18
CO3	4	3	3	3	3	3	4	3	3	3	3	3.27
CO4	4	3	3	3	3	3	4	3	3	3	3	3.27
CO5	3	4	3	4	3	3	3	3	4	3	3	3.27
Overall Mean Score												**3.23**

Result: The Score for this Course is 3.23 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = Total of Values / Total No. of Pos & PSOs	Mean Overall Score for Cos = Total of Mean Scores / Total No. of Cos

UNIT I

Transcendental and polynomial equations - Introduction -Bisection method - Iteration methods based on first degree equation - methods based on second degree equation- Rate of Convergence - Iteration Methods - Methods for Complex roots - Polynomial Equations. **(18 Hours)**

UNIT II

Interpolation and Approximation – Introduction - Lagrange and Newton Interpolations - Finite difference operators - Interpolating polynomials using Finite Differences – Hermite Interpolations. **(18 Hours)**

UNIT III

Numerical Differentiation - Introduction - Numerical Differentiation – Extrapolation methods - partial differentiation. **(18 Hours)**

UNIT IV

Numerical Integration - Methods Based on Interpolation - Composite Integration Methods - Romberg Integration - Double Integration. **(18 Hours)**

UNIT V

Ordinary Differential Equations - Introduction - Numerical Methods - Single step Methods. **(18 Hours)**

COURSE BOOK:

M. K. Jain, S. R. K. Iyengar & R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Pvt. Ltd., Publishers, Third Edition, 1996.

Unit I	:	Chapter 2 Sections 2.1 to 2.8
Unit II	:	Chapter 4 Sections 4.1 to 4.5
Unit III	:	Chapter 5 Sections 5.1 to 5.5
Unit IV	:	Chapter 5 Sections 5.6, 5.7, 5.9, 5.10, 5.11
Unit V	:	Chapter 6 Sections 6.1 to 6.3

BOOKS FOR REFERENCE:

1. John H. Mathews, Numerical Methods for Mathematics, science, and Engineering, Volume 54 of Lecture notes in Physics, Prentice hall, 1992.
2. Shankara Rao K., Numerical Methods for Scientists and Engineers, Prentice Hall of India, 2001.

ADVANCED CALCULUS

Semester: I **Hours: 6**

Code : 20PMA1C04 **Credits: 5**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO-1	Develop analytic and numerical techniques for solving problems using fundamental theorem of integral calculus.	PSO -5	S,Ap
CO-2	Analyze the concepts of implicit functions theorems.	PSO –3	An
CO-3	Evaluate integrals over curves and surfaces.	PSO – 4	E
CO-4	Explain the concept of differential forms	PSO – 1	K
CO-5	Deduce Poisson's equation from inhomogeneous wave equation.	PSO -1, PSO -3	S

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: I				**ADVANCED CALCULUS**						**Hours: 6**	
Code : 20PMA1C04										**Credits: 5**	
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	3	3	4	4	3	3	3	3	4	3.36
CO2	3	3	4	3	3	3	3	3	4	3	3	3.18
CO3	3	4	2	4	3	3	3	3	3	4	3	3.18
CO4	4	3	3	3	3	3	4	3	3	3	3	3.18
CO5	4	3	4	3	3	3	4	3	4	3	3	3.36
Overall Mean Score												**3.23**

Result: The Score for this Course is 3.23 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

Integration -The definite integral -The lower and upper integral of f over R- Sets of zero area-Basic Existence theorem for definite integral-Evaluation of definite integrals-Fundamental theorem of integral calculus. **(18 Hours)**

UNIT II

Differentials of transformations - Local approximations - Differentiable at a point and on an open set - Mean value theorem-Inverses of transformations -Jacobian of T- The implicit functions theorems- Functional dependence. **(18 Hours)**

UNIT III

Transformations of multiple integrals - Curves and arc length - Direction cosines for the line - Rectifiable curve - Smoothly equivalent curves - Surfaces and surface area - Smooth surface - Normal to smooth surface - Area of smooth surface - Smoothly equivalent surfaces - Orientable manifold -Integrals over curves and surfaces. **(18 Hours)**

UNIT IV

Differential forms -Curve functional - Surface functional - Region functional - Line integrals 1-form& 2-form in the XY plane-3-form in the XYZ space - Addition and multiplication of forms-Differentiation for forms - Vector analysis -Inner product - The theorems of Green, Gauss and Stokes. **(18 Hours)**

UNIT V

Exact forms and closed forms - Simply connected set - Applications - Inhomogeneous wave equations-Poisson's equation - Laplace equation – Harmonic functions- Green's first and second identities. **(18 Hours)**

COURSE BOOK:

R. Creighton Buck, Advanced calculus **(**THIRD EDITION), McGraw Hill Kogakusha (International Student Edition), 1978.

Unit I : Chapter 4 Sections 4.2 & 4.3
Unit II : Chapter 7 Sections 7.4 , 7.5 , 7.6 & 7.7
Unit III : Chapter 8 Sections 8.3, 8.4, 8.5 & 8.6
Unit IV : Chapter 9 Sections 9.2, 9.3 & 9.4
Unit V : Chapter 9 Sections 9.5 & 9.6

BOOKS FOR REFERENCE:

1. LYNNH.LOOMIS and SHLOMOSTERN BERG, Advanced Calculus, Revised Edition, Jones and Barlett Publishers, Boston, London.
   http://people.math.harvard.edu/~shlomo/docs/Advanced_Calculus.pdf
2. Frederick S. Woods, Advanced Calculus, New Edition, Ginn and Company, Newyork.

CRYPTOGRAPHY

Semester: I **Hours: 6**

Code : 20PMA1E1A **Credits: 4**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO-1	Encrypt and decrypt the hidden messages.	PSO–1	K
CO-2	Compare asymmetric and symmetric encryption.	PSO–3	E
CO-3	Analyze the structure and design of Advanced Encryption System.	PSO–3	An
CO-4	Develop an algorithm for decryption and encryption.	PSO–4	S
CO-5	Apply the basic techniques to protect data in computer and communication environment.	PSO–5	Ap

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : I				**CRYPTOGRAPHY**							**Hours: 6**
Code : 20PMA1E1A											**Credits: 4**
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	3	3	3	3	4	3	3	3	3	3.18
CO2	3	3	4	3	3	3	3	3	4	3	3	3.18
CO3	3	3	4	3	3	3	3	3	4	3	3	3.18
CO4	3	4	3	4	3	3	3	3	3	4	3	3.27
CO5	4	3	3	3	4	4	3	3	3	3	4	3.36
Overall Mean Score												3.23

Result: The Score for this Course is 3.23 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

Data Encryption Techniques - Introduction - Encryption Methods - Cryptography - Cryptanalysis - Substitution Ciphers - Transposition Ciphers - Steganography. **(18 Hours)**

UNIT II

Data Encryption Standards - Block Ciphers - Block Ciphers Modes of Operation - Feistel Ciphers - Data Encryption Standard - Triple DES - DES Design Criteria - Side Channel Attacks - Other Block Ciphers - Differential Cryptanalysis - Linear Cryptanalysis. **(18 Hours)**

UNIT III

Advanced Encryption Standard - Introduction - Advanced Encryption Standard - Overview of Rijndael - Optimization of the Cipher - Advantages and Limitations of Rijndael - Comparison of AES with Other Ciphers. **(18 Hours)**

UNIT IV

Symmetric Ciphers - Blowfish Encryption Algorithm - RC5 - RC4 - RC6 - Comparison between RC6 and RC5 - Idea. **(18 Hours)**

UNIT V

Public Key Cryptosystems - Introduction - Public Key Encryption - The RSA Algorithm – Timing Attacks. **(18 Hours)**

COURSE BOOK:

V. K. Pachghare, Cryptography and Information Security, PHI Learning Private Limited 2010.

UNIT I	:	Chapter 2 Sections 2.1 - 2.7
UNIT II	:	Chapter 3 Sections 3.1 -3.10.
UNIT III	:	Chapter 4 Sections 4.1 - 4.6
UNIT IV	:	Chapter 5 Sections 5.1 - 5.6
UNIT V	:	Chapter 7 Sections 7.1 - 7.4

BOOKS FOR REFERENCE:

1. William Stallings, Cryptography and Network Security Principles and Practices, fourth Edition, Prentice Hall.
2. Bruice schneier, Applied Cryptography, Second Edition, Wiley India.

COMBINATORICS

Semester: I **Hours: 6**

Code : 20PMA1E1B **Credits: 4**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO-1	Understand the advanced concept of permutations and combinations	PSO-1	K
CO-2	Compute generating function and apply them to a combinatorial problem	PSO-3	S
CO-3	Solve linear recurrence relation	PSO-5	An
CO-4	Apply the inclusion /exclusion principle	PSO-1	Ap
CO-5	Use poly's theory to count certain configuration in combinatorial aspects.	PSO-5	E

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : I				**COMBINATORICS**							**Hours: 6**
Code : 20PMA1E1B											**Credits: 4**
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	3	3	3	3	4	3	3	3	3	3.18
CO2	3	3	4	3	3	3	3	3	4	3	3	3.18
CO3	4	3	3	3	4	4	3	3	3	3	4	3.36
CO4	4	3	3	3	3	3	4	3	3	3	3	3.18
CO5	4	3	3	3	4	4	3	3	3	3	4	3.36
Overall Mean Score												**3.25**

Result: The Score for this Course is 3.25 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

Permutations and combinations: introduction – the rules of sum and product – permutations - combinations – distribution of distinct objects – distribution of non distinct objects Stirling's formula. **(18 hours)**

UNIT II

Generating functions : Introduction – generating functions for combinations – enumerators for permutations – distribution of distinct objects into non-distinct cells – partitions of integers – the Ferrer's graph – elementary relations. **(18 Hours)**

UNIT III

Recurrence relations : introduction – linear recurrence relations with constant coefficients – solutions by the technique of generating functions – a special class of non linear difference equations – recurrence relation with two indices. **(18 Hours)**

UNIT IV

The principle of inclusion and exclusion:– introduction – the principle of inclusion and exclusion – the general formula –Derangements – permutations with restrictions on relative positions – the Rook's polynomials-Permutations with forbidden positions. **(18 Hours)**

UNIT V

Polya's theory of counting –introduction – sets, relations and groups – equivalence classes under permutation groups – equivalence classes of functions – weights and inventories of functions – Polya's fundamental theorem – generalisation of Polya's theorem. **(18 Hours)**

COURSE BOOK:

C. L. Liu, Introduction to Combinatorial Mathematics, McGraw Hill Publishing Company Ltd., 1968.

Unit I	:	Chapter 1 Sections 1.1 to 1.7
Unit II	:	Chapter 2 Sections 2.1 to 2.7
Unit III	:	Chapter 3 Sections 3.1 to 3.5
Unit IV	:	Chapter 4 Sections 4.1 to 4.6
Unit V	:	Chapter 5 Sections 5.1 to 5.7

BOOKS FOR REFERENCE:

1. Anderson, Combinatorial Mathematics. Elarendon Press, 1974.
2. Balaji, G., Discrete Mathematics. (3rd Edition).G. Balaji Publishers.

CLASSICAL MECHANICS

Semester: I **Hours: 6**

Code : 20PMA1E1C **Credits: 4**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO-1	Understand the elementary principles and Formulate the Lagrangian.	PSO- 1	K
CO-2	Derive Lagrangian equations from Hamilton's principle.	PSO – 3	An, Ap
CO-3	Extend Hamilton's principle to nonholonomic system.	PSO – 4	S
CO-4	Reduce two body problem to one body problem.	PSO – 5	E
CO-5	Describe planar and spatial motion of rigid body.	PSO – 4	S

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : I				**CLASSICAL MECHANICS**					**Hours: 6**		
Code : 20PMA1E1C									**Credits: 4**		
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	3	3	3	3	4	3	3	3	3	3.18
CO2	3	3	4	3	3	3	3	3	4	3	3	3.18
CO3	3	4	3	4	3	3	3	3	3	4	3	3.27
CO4	4	3	3	3	4	4	3	3	3	3	4	3.36
CO5	3	4	3	4	3	3	3	3	3	4	3	3.27
Overall Mean Score												**3.25**

Result: The Score for this Course is 3.25 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

Survey of the elementary principles - Mechanics of a particle, mechanics of a system of particles - Constraints - D' Alembert's Principle and Lagrange's Equations - Velocity - dependent potentials and the dissipation function – Simple applications of the Lagrangian formulation. **(18 Hours)**

UNIT II

Variational principles and Lagrange's Equation - Hamilton's principle - Some techniques of the calculus of variations - Derivation of Lagrangian's equations from Hamilton's Principle. **(18 Hours)**

UNIT III

Extension of Hamilton's principle to non holonomic systems - Advantages of variational priniciple formulation - Conservation theorems and symmetry properties. **(18 Hours)**

UNIT IV

The two body central force problem - Reduction to the equivalent one body problem- The equations of motion and first integrals - The equivalent one dimensional problem and classification of orbits- The virial theorem - The differential equation for the orbit and integrable power-law potentials - Conditions for closed orbits (Bertrand's theorem). **(18 Hours)**

UNIT V

The Kelper problem - Inverse square law of force - The motion in time in the Kepler problem - The Laplace - Runge - Lenz vector. **(18 Hours)**

COURSE BOOK:

Herbert Goldstein, Classical Mechanics (Second Edition), Narosa Publishing House, 2001.

Unit I	**:**	Chapter 1
Unit II	**:**	Chapter 2 Sections 2.1-2.3
Unit III	**:**	Chapter 2 Sections 2.4-2.6
Unit IV	**:**	Chapter 3 Sections 3.1-3.6
Unit V	**:**	Chapter 3 Sections 3.7 -3.9

BOOKS FOR REFERENCE:

1. D. E. Rutherford, Classical Mechanics, Oliver Boyd, New York, 2000.
2. J. C. Upadhyaya, Classical Mechanics, Himalaya publishing House, Mumbai, 2003.

ALGEBRA - II

Semester: II **Hours: 6**

Code : 20PMA2C05 **Credits: 5**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO-1	Understand Module as a generalization of Vector Space.	PSO -1	K
CO-2	Construct the abelian groups generated by finite number of elements.	PSO – 3	S
CO-3	Differentiate between linearly independent vectors and linearly dependent vectors.	PSO – 5	An
CO-4	Find the matrices corresponding to linear transforms.	PSO -1	Ap
CO-5	Reduce the matrix to rational triangular form and canonical form.	PSO-5	E

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : II				**ALGEBRA - II**							**Hours: 6**
Code : 20PMA2C05											**Credits: 5**
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	3	3	3	3	4	3	3	3	3	3.27
CO2	3	3	4	3	3	3	3	3	4	3	3	3.18
CO3	4	3	3	3	4	4	3	3	3	3	4	3.36
CO4	4	3	3	3	3	3	4	3	3	3	3	3.18
CO5	4	3	3	3	4	4	3	3	3	3	4	3.36
Overall Mean Score												**3.27**

Result: The Score for this Course is 3.27 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

Vector spaces - Elementary Basic Concepts - Subspaces - Homomorphism - Isomorphism - Internal direct Sum - Linear Independence - Linear Span - Finite Dimensional vector space - linearly independent vectors - Basis of V – Dual spaces. **(18 Hours)**

UNIT II

Inner Product Spaces - Norm of a vector-Orthogonal vectors-Orthogonal Complement -Orthonormal Set-Modules-Cyclic modules and Finitely Generated modules. **(18 Hours)**

UNIT III

Linear transformations -The Algebra of Linear Transformations - Algebra over a field F-Invertible or Regular Transformation - Singular Transformation - Characteristic Roots - Matrices-Algebra of Matrices-Canonical Forms : Triangular Form. **(18 Hours)**

UNIT IV

Canonical Forms : Nilpotent Transformations - A decomposition of V : Jordan Form - Jordan Canonical Form - Rational Canonical Form - Trace and Transpose. **(18 Hours)**

UNIT V

Determinants - The formal Properties in the theory of Determinants - Cramer's Rule for solving the system of linear Equations - Hermitian, Unitary, and Normal Transformations - Real Quadratic Forms. **(18 Hours)**

COURSE BOOK:

I. N. Herstein, Topics in Algebra (Second Edition), John Wiley & Sons, 2012

Unit I	**:**	Chapter 4 Sections 4.1 - 4.3
Unit II	**:**	Chapter 4 Sections 4.4 - 4.5
Unit III	**:**	Chapter 6 Sections 6.1 - 6.4
Unit IV	**:**	Chapter 6 Sections 6.5 - 6.8
Unit V	**:**	Chapter 6 Sections 6.9 - 6.11

BOOKS FOR REFERENCE:

1. Vijay K. Khanna., & Bhambri, S. K. A Course in Abstract Algebra. (Fourth Edition). Vikas Publishing House Pvt. Ltd, 2013.
2. Kenneth Hoffman, Ray Kunze, Linear Algebra (Second Edition), Pearson India Education Services Pvt. Ltd.

ANALYSIS - II

Semester: II **Hours: 6**

Code : 20PMA2C06 **Credits: 5**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO–1	Compare the convergence and uniform convergence of sequence of functions	PSO - 3	E
CO–2	Extend the structure of the real line to complex and vector valued functions on intervals	PSO - 5	S
CO–3	Derive the properties of analytic functions	PSO - 3	An, Ap
CO–4	Discuss integration of real valued functions on intervals	PSO - 1	K,C
CO–5	Develop the Lebesque integral in several distinct ways	PSO -4	S

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : II				**ANALYSIS - II**							**Hours: 6**
Code : 20PMA2C06											**Credits: 5**
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	3	3	4	3	3	3	3	3	4	3	3	3.18
CO2	4	3	3	3	4	4	3	3	3	3	4	3.36
CO3	3	3	4	3	3	3	3	3	4	3	3	3.18
CO4	4	3	3	3	3	3	4	3	3	3	3	3.18
CO5	3	4	3	4	3	3	3	3	3	4	3	3.27
Overall Mean Score												**3.23**

Result: The Score for this Course is 3.23 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

The Riemann - Stieltjes integral - Definition and existence of the integral - properties of the integral - integration and differentiation. **(18 Hours)**

UNIT II

Sequences of series of functions - Discussion of Main Problem - uniform convergence - uniform convergence and continuity - uniform convergence and integration-uniform convergence and differentiation. **(18 Hours)**

UNIT III

Equicontinuous families of functions - The Stone Wierstrass theorem -Some Special Functions- power series - the exponential and logarithmic functions - The trigonometric functions. **(18 Hours)**

UNIT IV

The algebraic completeness of the complex field - Fourier series-The Gamma function - some consequences - Stirling's formula. **(18 Hours)**

UNIT V

The Lebesgue theory- set functions - construction of the Lebesgue Measure - measure spaces - measurable functions - simple functions - integration-comparison with the Riemann integral - integration of complex functions-functions of class L^2 . **(18 Hours)**

COURSE BOOK:

Walter Rudin, Principles of Mathematical Analysis(Third edition) , McGraw-Hill International Company (International Student Edition),1976.

Unit I	:	Chapter 6 Sections 6.1 to 6.22
Unit II	:	Chapter 7 Sections 7.1 to 7.18
Unit III	:	Chapter 7 Sections 7.19 to 7.33 & Chapter 8 Sections 8.1 to 8.7
Unit IV	:	Chapter 8 Sections 8.8 to 8.22
Unit V	:	Chapter 11

BOOKS FOR REFERENCE:

1. Tom P. Apostol, Mathematical Analysis,Narosa Publishing House, New Delhi, 1985.
2. A. J.White, Real Analysis, An Introduction, Addison Wesley Publishing Co., Inc. 1968.

MATHEMATICAL STATISTICS

Semester: II **Hours: 6**

Code : 20PMA2C07 **Credits: 5**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO–1	Explore the essentials of Distribution theory	PSO - 1	C
CO–2	Construct the theory of probability to make inferences	PSO - 3	An, Ap
CO–3	Promote knowledge of special distributions	PSO - 4	An
CO–4	Build effective methods of finding the distribution of a function of several random variables	PSO - 5	S
CO–5	Provide ways of approximation to determine complicated probability density functions	PSO -2	An

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : II				**MATHEMATICAL STATISTICS**							**Hours: 6**
Code : 20PMA2C07											**Credits: 5**
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	3	3	3	3	4	3	3	3	3	3.18
CO2	3	3	4	3	3	3	3	3	4	3	3	3.18
CO3	3	4	3	4	3	3	3	3	3	4	3	3.27
CO4	4	3	3	3	4	4	3	3	3	3	4	3.36
CO5	3	3	3	3	4	3	3	3	3	3	4	3.18
Overall Mean Score												**3.23**

Result: The Score for this Course is 3.23 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

Distributions of Random Variables - the probability set function - random variables - the probability density function - the distribution function - certain probability models - mathematical expectation - some special mathematical expectations -Chebyshev's inequality. **(18 Hours)**

UNIT II

Conditional Probability and Stochastic Independence - Conditional Probability - Marginal and conditional distributions - the correlation coefficient - Stochastic independence. **(18 Hours)**

UNIT III

Some Special Distributions-The Binomial, Trinomial and multinomial Distributions-The Poisson distribution - The Gamma and Chi-square Distributions - The Normal Distribution - The Bivariate Normal Distribution. **(18 Hours)**

UNIT IV

Sampling Theory - Transformations of variables of the discrete type - Transformations of variables of the continuous type - The t and F distributions - Extensions of the change of variable technique - Distributions of order statistics - The moment generating function technique - The distributions of $\bar{X}$ and nS^2/σ^2 - Expectations of functions of random variables. **(18 Hours)**

UNIT V

Limiting distributions - Stochastic convergence - Limiting Moment generating functions - The Central Limit Theorem - Some theorems on Limiting distributions. **(18 Hours)**

COURSE BOOK:

Robert V. Hogg & Allen T. Craig, Introduction to Mathematical Statistics, IV Edition, Macmillan Publishing Co., Inc. NEW YORK, Collier Macmillan Publishers, 1978.

Unit I	:	Chapter 1 : Sections 1.4 to 1.11
Unit II	:	Chapter 2 : Sections 2.1 to 2.4
Unit III	:	Chapter 3 : Sections 3.1 to 3.5
Unit IV	:	Chapter 4 : Sections 4.1 to 4.9
Unit V	:	Chapter 5 : Sections 5.1 to 5.5

BOOKS FOR REFERENCE:

1. Miller and M. Miller, Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2004.
2. Jun Shao, Mathematical Statistics, Second Edition, Springer, 2003.

OPTIMIZATION THEORY

Semester: II **Hours: 6**

Code : 20PMA2E2A **Credit: 4**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO-1	Acquire knowledge of Fibonacci method for optimization.	PSO - 1	K
CO-2	Understand constrained optimization techniques through linear and nonlinear programming.	PSO - 1	C
CO-3	Describe the algorithms and solution analysis.	PSO - 3	An
CO-4	Solve optimization problems.	PSO - 4	S
CO-5	Compare the abstract properties of various optimization techniques.	PSO – 3,PSO-1	E

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : II				**OPTIMIZATION THEORY**							**Hours: 6**
Code : 20PMA2E2A											**Credits: 4**
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	3	3	3	3	4	3	3	3	3	3.18
CO2	4	3	3	3	3	3	4	3	3	3	3	3.18
CO3	3	3	4	3	3	3	3	3	4	3	3	3.18
CO4	3	4	3	4	3	3	3	3	3	4	3	3.27
CO5	4	3	4	3	3	3	4	3	4	3	3	3.36
Overall Mean Score												**3.23**

Result: The Score for this Course is 3.23 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

One Dimensional Optimization : Introduction - Function Comparison Methods - Polynomial Interpolation Methods - Iterative Methods - Function Comparison Methods : Two Point Equal Interval Search - Method of Bisection - Fibonacci Method - Golden Section Search - Polynomial Interpolation - Quadratic Interpolation - Cubic Interpolation -Iterative Methods: Newton's Method-Secant Method. **(18 Hours)**

UNIT II

Unconstrained Gradient Based Optimization Methods : Introduction - Gradient and Conjugate Gradient Type Algorithms - Method of Steepest Descent - Conjugate Gradient Method - Newton Type Methods : Newton's Method - Marquardts's Method - Quasi Newton Methods : Quasi-Newton Algorithms.

(18 Hours)

UNIT III

Linear Programming : Introduction - Simplex Method -Case study Equipment Bags - Movement from one extreme point to another - Simplex Algorithm - Case Study Revisited- Revised Simplex Method. **(18 Hours)**

UNIT IV

Finding Initial Solution - Two Phase Simplex Method – Duality - Duality Theory - Dual Simplex Method. **(18 Hours)**

UNIT V

Constrained Optimization Methods: Introduction - Lagrange Multipliers - Kuhn-Tucker Conditions - Convex Optimization - Transformation Methods: Penalty Function Techniques - Method of Multipliers. - Linearization Methods: Linearly Constrained Problems - Cutting Plane Method. **(18 Hours)**

COURSE BOOK:

Mohan C Joshi & Kannan M Moudgalya, Optimization Theory and Practice, NarosaPublishing House, Chennai, 2004.

Unit I : Chapter 2 : Sections 2.1.1- 2.1.3, 2.2.2 - 2.2.5 & 2.3.2-2.3.3.

Unit II : Chapter 3 : Sections 3.1,3.2.2 - 3.2.3, 3.3.2 – 3.3.3 & 3.4.2

Unit III : Chapter 4 : Sections 4.1 & 4.2.1 - 4.2.5

Unit IV : Chapter 4 : Sections 4.3.2 & 4.4.2 - 4.4.3.

Unit V : Chapter 5 : Sections 5.1 & 5.1.1 - 5.1.3, 5.2.2 , 5.2.3, & 5.3.2 - 5.3.3.

BOOKS FOR REFERENCE:

1. Wiehelm Forst, dieter Hoffmann, Optimization – Theory and Practice, 2010th edition, Springer.
2. Stephen Boyd, Lieven Vandenberghe, Convex Optimization, Cambridge University Press, 2004.

DIFFERENTIAL GEOMETRY

Semester: II **Hours: 6**

Code : 20PMA2E2B **Credits: 4**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO-1	Understand the basic principles of space curves and surfaces.	PSO - 1	K
CO-2	Analyze the concept of osculating circles and spheres and their properties.	PSO -3	Ap
CO-3	Derive differential equations of Geodesics using normal property.	PSO -1	K
CO-4	Discuss the principal curvature and lines of curvature.	PSO - 4, PSO - 5	An
CO-5	Describe the local intrinsic property of a surface.	PSO -3	K, Ap

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : II				**DIFFERENTIAL GEOMETRY**						**Hours: 6**	
Code : 20PMA2E2B										**Credits: 4**	
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	3	3	3	3	4	3	3	3	3	3.18
CO2	3	3	4	3	3	3	3	3	4	3	3	3.18
CO3	4	3	3	3	3	3	4	3	3	3	3	3.18
CO4	4	4	3	4	4	4	3	3	3	4	4	3.45
CO5	3	3	4	3	3	3	3	3	4	3	3	3.63
Overall Mean Score												**3.32**

Result: The Score for this Course is 3.32 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

Theory of space curves - Representation of space curves - Unique parametric representation of a space curve - Arc length - Tangent and osculating plane - principal normal and binormal - curvature and torsion - Behaviour of a curve near one of its points - The curvature and torsion of a curve as the intersection of two surfaces - contact between curves and surfaces. **(18 Hours)**

UNIT II

Osculating circle and osculating sphere - Locus of centres of spherical curvature - Tangent surfaces , involutes and evolutes - Bertrand curves - Spherical indicatrix - Intrinsic equations of space curves -Fundamental Existence theorem for space curves - Helices. **(18 Hours)**

UNIT III

The first fundamental form and local intrinsic properties of a surface - Definition of a surface- Nature of points on a surface - Representation of a surface - curves on a surface -Tangent plane and surface normal -The general surface of revolution -Helicoids - metric on a surface -The first fundamental form - Direction coefficients on a surface - Families of curve -Orthogonal trajectories - Double family of curves. **(18 Hours)**

UNIT IV

Geodesics on a surface - Geodesics and their differential equations - Canonical geodesic equations - Geodesics on surfaces of revolution - Normal property of Geodesics – Differential equations of geodesics using normal property - Existence theorems - geodesics parallels - geodesics polar co-ordinates - geodesics curvature. **(18 Hours)**

UNIT V

The Second fundamental form and local non intrinsic properties of a surface - Second fundamental form - Classification of points on a surface - principal curvature-lines of curvature – Dupin indicatrix. **(18 Hours)**

COURSE BOOK:

D. Somasundaram , Differential Geometry A First Course, Narosa Publishing House, 2008

Unit I	:	Chapter 1 : Sections 1.1 - 1.10
Unit II	:	Chapter 1 : Sections 1.11 -1.20
Unit III	:	Chapter 2 : Sections 2.1 - 2.13
Unit IV	:	Chapter 3 : Sections 3.1 - 3.10
Unit V	:	Chapter 3 : Sections 3.1 - 3.10

BOOKS FOR REFERENCE:

1. Willmore, An Introduction to Differential Geometry, Oxford University Press, London, 1972.
2. Mittal, Agarwal, Differential Geometry, Thirtieth Edition, Krishna Prakashan,Meerut, 2003.

GRAPH THEORY

Semester: II **Hours: 6**

Code : 20PMA2E2C **Credits: 4**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO–1	Understand the techniques in Graph Theory.	PSO -1	K
CO–2	Represent real life problems in a graph.	PSO-4	Ap
CO–3	Develop the skill of constructing models using graphs.	PSO -3	S
CO–4	Discover solutions to problems using algorithmic approach.	PSO -3, PSO - 1	An,Ap
CO–5	Inculcate the spirit of research in network problems.	PSO -5	S

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : II				**GRAPH THEORY**							**Hours: 6**
Code : 20PMA2E2C											**Credits: 4**
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	3	3	3	3	4	3	3	3	3	3.18
CO2	3	4	4	3	3	3	3	3	3	4	3	3.27
CO3	3	3	4	3	3	3	3	3	4	3	3	3.18
CO4	4	3	4	3	3	3	4	3	4	3	3	3.36
CO5	4	3	3	3	4	4	3	3	3	3	4	3.36
Overall Mean Score												**3.27**

Result: The Score for this Course is 3.27 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

Trees and Connectivity - Definitions and simple properties - bridges – Spanning trees - Connector problems - Shortest path problems - Cut vertices and connectivity. **(18 Hours)**

UNIT II

Euler Tours and Hamiltonian Cycles- Euler Tours - The Chinese postman Problem - Hamiltonian Graphs - The Travelling Salesman Problem. **(18 Hours)**

UNIT III

Matchings - Matchings and Augmenting paths - The Marriage Problem – The Personnel Assignment Problem. **(18 Hours)**

UNIT IV

Planar Graphs - Plane and Planar Graphs - Euler's Formula - The Platonic Bodies - Kuratowski's theorem - Non-Hamiltonian Plane Graphs - The Dual of a plane Graph. **(18 Hours)**

UNIT V

Colouring - Vertex Colouring - Vertex Colouring Algorithms - Critical Graphs - Cliques - Edge colouring - Map colouring. **(18 Hours)**

COURSE BOOK:

John Clark & Derek Allan Holton, A First Look At Graph Theory, Allied Publishers Ltd., 1995

Unit I	:	Chapter 2
Unit II	:	Chapter 3
Unit III	:	Chapter 4 Sections 4.1 to 4.3
Unit IV	:	Chapter 5
Unit V	:	Chapter 6

BOOKS FOR REFERENCE:

1. R. Balakrishnan and K. Ranganathan, A Textbook of Graph Theory, Springer International Edition, New Delhi, 2008.
2. F.Harary, Graph Theory, Addison – Wesley, Reading, Mass, 1969.

IDC - MATLAB and LaTeX

Semester: II **Hours: 4**

Code : 20PMA2GE1 **Credits: 3**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO-1	Understand basic programming techniques.	PSO- 1	K,C
CO-2	Create array and matrix and perform operations in it.	PSO – 3,PSO-2	Ap, S
CO-3	Write programs to solve ODE and Numerical Integration.	PSO – 4,PSO-2	S
CO-4	Plot with special graphics.	PSO – 5,PSO-2	An,Ap
CO-5	Report work in scientific typesetting in LaTeX.	PSO – 1,PSO-2	S

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester : II				**IDC – MATLAB and LaTeX**							**Hours: 4**
Code : 20PMA2GE1											**Credits: 3**
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	3	3	3	3	3	4	3	3	3	3	3.18
CO2	3	3	4	3	4	3	3	4	4	3	3	3.36
CO3	3	4	3	4	3	3	3	4	3	4	3	3.27
CO4	4	3	3	3	4	4	3	4	3	3	4	3.45
CO5	4	3	3	3	4	3	4	4	3	4	3	3.45
Overall Mean Score												**3.34**

Result: The Score for this Course is 3.34 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I

Starting with MATLAB - Creating Arrays - Creating A One-dimensional Array (Vector) - Creating Two-dimensional Array (Matrix) - Notes About Variables In MATLAB - The Transpose Operator - Array Addressing - Using A Colon : In Addressing Arrays - Adding Elements To Existing Variables - Deleting Elements - Built-in Functions For Handling Arrays - Strings And Strings As Variables - Mathematical Operations with Arrays. **(12 Hours)**

UNIT II

Using Script Files and Managing Data - Programming in MATLAB - Relational And Logical Operators - Conditional Statements - The Switch-case Statement - Loops - Nested Loops And Nested Conditional Statements - The Break And Continue Commands - Polynomials, Curve Fitting, and Interpolation **(12 Hours)**

UNIT III

Applications in Numerical Analysis: Solving an Equation with One Variables - Finding a Minimum or a Maximum of a Function - Numerical Integration - ODE . Three-Dimensional Plots: Line Plots - Mesh and Surface Plots - Plots With Special Graphics. **(12 Hours)**

UNIT IV

Document layout and Organization – document class, page style, parts of the document, Displayed Text – centering and indenting, lists, Theorem – like declarations, Tables. **(12 Hours)**

UNIT V

Mathematical formulas – Mathematical environments, main elements of Math mode, Mathematical symbols, Additional elements, Fine-tuning mathematics, Drawing pictures with LaTeX. **(12 Hours)**

COURSE BOOKS:

1. **"MATLAB An Introduction with Application"** by **A. Gilat**, John Wiley & Sons, fourth edition, 2010.

2. **"A Guide to LATEX"** by **H. Kopka and P. W. Daly**, Third Edition, Addison-Wesley,London,1999.

Unit I	:	Chapter 1: Sections: 1.1 - 1.9 (Book 1)
		Chapter 2: Sections: 2.1- 2.10 (Book 1)
		Chapter 3 : Sections: 3.1- 3.9(Book 1)
Unit II	:	Chapter 4 : Sections: 4.1- 4.5(Book 1)
		Chapter 6: Sections: 6.1- 6.6 (Book 1)
		Chapter 8 : Sections: 8.1- 8.6(Book 1)
Unit III	:	Chapter 9 : Sections: 9.1- 9.4(Book 1)
		Chapter10: Sections: 10.1- 10.3(Book 1)
Unit IV	:	Chapter 3: Sections: 3.1- 3.3 (Book 2)
		Chapter 4 : Sections : 4.2,4.3,4.5 & 4.8 (Book 2)
Unit V	:	Chapter 5 : Sections : 5.1- 5.5 (Book 2)
		Chapter 6 : Sections : 6.1 (Book 2)

BOOKS FOR REFERENCE:

1. A. Gilat & J. Wiley, MATLAB, An Introduction with Applications, Fifth Edition, May 2016.
2. Stefan Kottwitz, Packt, LaTeX Beginner's Guide, March 2011.

SOFT SKILLS

Semester: II **Hours: 2**

Code : 20PSE2S01 **Credit: 1**

COURSE OUTCOMES:

CO. NO.	UPON COMPLETION OF THIS COURSE THE STUDENTS WILL BE ABLE TO	PSO ADDRESSED	COGNITIVE LEVEL
CO - 1	Develop their social, interpersonal, cognitive, ethical, professional, reading and communication skills	PSO-1	K
CO - 2	Increase their self-esteem and confidence.	PSO-2,4	Ap
CO - 3	Achieve their short and long term goals.	PSO-3	Sy
CO - 4	Prepare and formulate their resumes wisely.	PSO-4	Ap
CO - 5	Face the mock group discussions and interviews with a challenge and choose their right career.	PSO-5	Ap

RELATIONSHIP MATRIX FOR COURSE OUTCOMES, PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES

Semester: II				**SOFT SKILLS**							**Hours: 2**
Code : 20PSE2S01											**Credit: 1**
Course Outcomes	**Programme Outcomes (PO)**						**Programme Specific Outcomes (PSO)**					**Mean Score of CO's**
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	
CO1	4	4	4	4	4	5	4	4	4	4	5	4.18
CO2	4	4	4	4	4	5	4	4	4	4	5	4.18
CO3	4	4	4	4	4	5	4	4	4	4	5	4.18
CO4	4	4	4	4	4	5	4	4	4	4	5	4.18
CO5	4	4	4	4	4	5	4	4	4	4	5	4.18
Overall Mean Score												**4.18**

Result: The Score for this Course is 4.18 (High Relationship)

Note:

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%	81 - 100%
Scale	1	2	3	4	5
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0	4.1 - 5.0
Quality	Very Poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Score of Cos = $\frac{\text{Total of Values}}{\text{Total No. of Pos \& PSOs}}$	Mean Overall Score for Cos = $\frac{\text{Total of Mean Scores}}{\text{Total No. of Cos}}$

UNIT I: SOFT SKILLS

Introduction - Soft skills - Importance of soft skills - Selling your soft skills - Attributes regarded as soft skills - Soft skills - Social - Soft skills - Thinking - Soft skills - Negotiating - Exhibiting your soft skills - Identifying your soft skills - Improving your soft skills - will formal training enhance your soft skills - Soft Skills training - Train yourself - Top 60 soft skills - Practicing soft skills - Measuring attitude. (**6 Hours)**

UNIT II: CAREER PLANNING

Benefits of career planning - Guidelines for choosing a career - Myths about choosing a career - Tips for successful career planning - Developing career goals - Final thoughts on career planning - Things one should know while starting career and during his/her career. (**6 Hours)**

UNIT III: ART OF LISTENING AND SPEAKING

Two ears, one mouth - Active listening - Kinds of Listening, Common - poor listening habits - Advantages of listening - Listening Tips. Special features of Communication - Process - Channels of Communication - Net Work - Barriers - Tips for effective communication and Powerful presentation - Art of public speaking - Public Speaking tips - Over coming fear of public speaking. (**6 Hours)**

UNIT IV: ART OF READING AND WRITING

Good readers - Benefits - Types - Tips - The SQ3R Technique - Different stages of reading - Rates of Reading - Determining a student's reading rate - Increasing reading rate - Problems with reading - Effective reader - Importance of writing - Creative writing - Writing tips - Drawbacks of written communication. **(6 Hours)**

UNIT V: PREPARING CV / RESUME

Meaning - Difference among Bio-data, CV and Resume - The terms - The purpose of CV writing - Types of resumes - Interesting facts about resume - CV writing tips - CV/Resume preparation - the dos - CV/Resume preparation - the don'ts - Resume check up - Design of a CV - Entry level resume - The content of the resume - Electronic resume tips - References - Power words - Common resume blunders - Key skills that can be mentioned in the resume - Cover letters - Cover letter tips. **(6 Hours)**

COURSE BOOK:

- Dr. K. Alex, Soft Skills, Chand & Company Pvt. Ltd., New Delhi.

REFERENCE BOOK:

1. Dr. T. Jeya Sudha & Mr. M.R. Wajida Begum : Soft Skills/Communication Skills, New Century Book House (P) Ltd., Chennai.
2. S. Hariharen, N. Sundararajan & S.P. Shanmuga Priya : Soft Skills, MJP Publishers, Chennai.

CONTINUOUS INTERNAL ASSESSMENT COMPONENT (CIA)

THEORY:

COMPONENT	MARKS
Internal test I	40
Internal test II	40
Seminar	10
Term Paper	5
Attendance	5
Total	**100**

CONTINUOUS INTERNAL ASSESSMENT COMPONENT (CIA)

Passing Minimum: 50% out of 100

INTERNAL QUESTION PATTERN

(Maximum Marks-40)

Part - A

10 Questions × 1Mark = 10 Marks

Part - B

2 Questions × 5 Marks = 10 Marks

(Internal Choice and One Question from Each Unit)

Part - C

2 Questions × 10 Marks = 20 Marks

(Open Choice, Two Questions out of Three)