

2020
-21

Multani Mal Modi College, Patiala

Unit Planning M.Sc Mathematics

Department of Mathematics



UNIT PLANNING

MULTANI MAL MODI COLLEGE, PATIALA
UNIT PLAN
Class – MSc I (Semester I) Mathematics

Subject : Algebra-I

Subject Code: MM 401

Subject Teacher : Ms. Rajvinder Kaur

Session : 2020-21

S.No.	Syllabus/Topics	Reference	Mode of Transactions	Additional Resources*
December 2020				
1	Review of Groups, Subgroups, Lagrange's Theorem, Normal Subgroups, Cyclic groups, Quotient Group, permutation Group, Isomorphism theorems	1.Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra(Chapter-4 and 5) 2.Khanna and Bhambri,A course in Abstract Algebra(Chapter 2 and 3)	Lecture, Discussion	
2	Introducing the concept of simple group, maximal Normal Group and relation between them, Subnormal Series, Normal Series, Composition Series	1.Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra (Chapter-6) 2.Surjeet singh, Qazi Zameeruddin: Modern Algebra(Chapter-5)	Lecture, Hand Written notes	Assignment-1
3	Examples of composition series related to cyclic groups and permutation Group		Lecture, Discussions	
4	ZassenHaus Lemma Jordan Holder Theorem For finite groups, Schreier's refinement Theorem,Jordan Holder Theorem For General groups and Jordan Holder Theorem implies fundamental Theorem of Arithmetic		Lecture, Discussions and Hand Written notes	
5	Assignment-1 Discussions		Seminar/Discussions	
6	Solvable Groups ,Nilpotent Groups	1.Bhattacharya, Jain, Nagpaul: Basic AbstractAlgebra(Ch-6) 2.Surjeet singh, Qazi Zameeruddin: Modern Algebra(Chapter-5)	Lecture, Hand Written Notes	

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7	Permutation Groups, Cyclic Decomposition, Alternating group A_n , Simplicity of A_n , related examples	1.Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra(Chapter4 and 7)	Lecture/Discussions	
8	Group action, Stabilizer, orbit, Class equation and its applications, Conjugacy classes in permutation groups.	1.Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra(Chapter-5)	Lecture	Video Lecture-1 -By prof. Krishna Hanumanthu,Chennai Mathematical institute
9	Cauchy theorem for finite groups, Sylow p -group, Sylow's theorems and examples related to simplicity of groups, Groups of order p^2 , pq .	1.Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra (Chapter-8) 2.Khanna and Bhambri, A course in Abstract Algebra(Chapter 4 and 5)	Lecture,Discussions	Video Lecture-2 video Lecture-3 By prof. Krishna Hanumanthu,Chennai Mathematical institute
January 2021				
10	Structure theory of groups, Fundamental theorem of finitely generated abelian groups, Invariants of a finite abelian group,	Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra(Chapter-8) Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra(Chapter-8)	Lecture/Notes	Assignment-2
11	Groups of Automorphisms of cyclic groups homo.between two cyclic groups.	Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra(Chapter-8)	Lecture/Discussions	
12	Review of Rings, Subrings, Ideals, Quotient Rings, Ring Homo and Isomorphism Theorems	Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra (Chapter-9 and 10)	Lecture	
13	Assignment-2,Discussions		Seminar/Discussions	
February 2021				
14	Algebra of Ideals, Maximal and prime ideals, Ideal in Quotient rings,	1.Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra(Chapter-10)	Lecture	
15	Field of Quotients of integral Domain, Matrix Rings and their ideals; Rings of Endomorphisms of Abelian Groups.	2. Surjeet singh, Qazi Zameeruddin: Modern Algebra(Chapter-7 and 8)	Lecture/Discussions	
16	Seminar and class tests on Important Topics		Seminar/Discussions	

UNIT PLANNING

17	Discussion (OLD University Papers and Problems)			
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M. M. Modi College, Patiala

MULTANI MAL MODI COLLEGE, PATIALA				
UNIT PLAN				
Class – MSc I (Semester I) Mathematics				
Subject: MATHEMATICAL ANALYSIS			Subject Code:- MM 402	
Subject Teacher :- Chetna Rani Gupta			Session :- 2020-21	
S.No.	Syllabus/Topics	Reference	Mode of Transactions	Additional Resorces*
December 2020				
1	Review of extended Real	H.L.Royden, <i>Real</i>	Lecture,	

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	Number System	<i>Analysis</i> <i>pearson 4th ed</i> (chapter 2&3)	discussion	
2	Algebras, σ - algebra, their properties		Lecture ,discussion	
3	General measurable spaces, measure spaces, properties of measure, Complete measure		Lecture, discussion	video lecture by Prof I.K.Rana ,IIT Bombay
January 2021				
4	Lebesgue outer measure and its properties measurable sets and Lebesgue measure	H.L.Royden, <i>Real Analysis pearson 4th ed</i> (chapter 2&3)	Lecture, discussion	
5	A non measurable set		Lecture, discussion	Assignment1MA
6	Measurable function w.r.t. general measure.		Lecture, discussion	
7	Borel and Lebesgue measurability.		Lecture, discussion	Assignment 2MA
January 2021				
8	Integration of non-negative measurable functions	H.L.Royden, <i>Real Analysis pearson 4th ed</i> (Chapter 4,5&6)	Lecture,discussion	
9	Fatou's lemma, Monotone convergence theorem		Lecture, discussion	
10	Lebesgue convergence theorem, The general integral, Integration of series, Riemann and lebesgue integrals.		Lecture, discussion	
11	Differentiation; Vitalis Lemma, The Dini derivatives		Lecture, discussion	
12	Functions of bounded variation		Lecture, discussion	
13	Differentiation of an Integral		Lecture, discussion	
14	Absolute Continuity		Lecture, discussion	
15	Convex Fucntions and Jensen's inequality		Lecture, discussion	Assignment 3 MA
February 2021				
16	Linear transformations	Walter Rudin, <i>Principles of Mathematical Analysis ,third edition</i> (Chapter 9)	Lecture, discussion	
17	Derivatives in an open		Lecture,	

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	subset of \mathbb{R}^n , Chain Rule		discussion	
18	Partial derivatives, Interchange of the order of differentiation		Lecture, discussion	
19	Derivatives of higher orders, Taylor's theorem		Lecture, discussion	
20	Inverse function theorem		Lecture, discussion	video lecture by Prof Sudipta Dutta IIT kanpur
21	Implicit function theorem.		Lecture, discussion	Assignment 4 MA
22	Seminar on Important Topics			
23	Discussion (Previous University Papers and Problems)			

MULTANI MAL MODI COLLEGE, PATIALA

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Class – M.Sc.- I (Semester I) Mathematics

Subject : Topology-1

Subject Code: MM-403

Subject Teacher : Dr. Chetna

Session : 2020-21

S.No.	Syllabus Covered	Suggested Reading/ Reference Books	Mode of Transactions	Additional Resources*
December 2020				
1	<u>Cardinals:</u> Equipotent sets, Countable and Uncountable sets, Cardinal Numbers and their Arithmetic, Bernstein's Theorem and the Continuum Hypothesis.	W.J. Pervin General Topology, Ch. 2,5 James Dugundji; James Munkres TOPOLOGY, Ch. 3,4,5	Lecture	
2	<u>Topological Spaces:</u> Definition and examples, Euclidean spaces as topological spaces.		Lecture	PPT
3	Basis for a given topology	W.J. Pervin Foundations of General Topology, Ch. 5 James Dugundji; James Munkres TOPOLOGY, Ch. 3	Lecture	
4	Topologizing of Sets; Sub-basis, Equivalent Basis.	W.J. Pervin Foundations of General Topology, Ch. 2,5 James Dugundji; James Munkres TOPOLOGY, Ch. 3,4,5	Lecture	
5	Examples discussed		Discussion/Seminar	Vedio Lecture by Prof Veeramani; IIT Madras.
6	Elementary Concepts, Topologizing with pre-assigned elementary operations. Relativization, Subspaces.	W.J. Pervin Foundations of General Topology, Ch. 2,5 James Dugundji; James Munkres TOPOLOGY, Ch. 3,4,5	Lecture	Assignment
7	<u>Maps and Product Spaces:</u> Continuous Maps, Characterization of Continuity, Continuity at a point.	W.J. Pervin : Foundations of General Topology. Ch-2,5	Lecture	

8	Piecewise definition of Maps and Nhd finite families.	James Dugundji; James Munkres TOPOLOGY, Ch. 3,4,5	Lecture	
9	Open Maps and Closed Maps, Homeomorphisms and Embeddings.	James Dugundji; James Munkres TOPOLOGY, Ch. 3,4,5	Lecture	
10	Assignment Discussion		Lecture	
January 2021				
11	<u>Cartesian Product Topology</u> , Elementary Concepts in Product Spaces, Continuity of Maps in Product Spaces and Cartesian Products.	James Dugundji; James Munkres TOPOLOGY, Ch. 3,4,5	Lecture	
12	<u>Connectedness</u> : Connectedness and its characterizations, Continuous image of connected sets, Connectedness of Product Spaces.	W.J. Pervin Foundations of General Topology, Ch. 2,5. Munkres TOPOLOGY, Ch. 3,4,5	Lecture	Vedio Lecture by Prof veeramani; IIT, Madras
13	Applications to Euclidean spaces. Components, Local Connectedness and Components, Product of Locally Connected Spaces. Path Connectedness.	W.J. Pervin Foundations of General Topology, Ch. 2,5. Munkres TOPOLOGY, Ch. 3,4,5	Lecture	
February 2021				
14	Compactness and Countable Compactness, Local Compactness T_0 , T_1 , and T_2 spaces, T_2 spaces and Sequences One-Point Compactification.	W.J. Pervin Foundations of General Topology, Ch. 2,5. Munkres TOPOLOGY, Ch. 3,4,5	Lecture	
15	Axioms of Countability and Separability, Equivalence of Second axiom Separable and Lindelof in Metric Spaces. Equivalence of Compact and Countably Compact Sets in Metric Spaces.	W.J. Pervin Foundations of General Topology, Ch. 2,5. Munkres TOPOLOGY, Ch. 3,4,5	Lecture	
16	Discussion (OLD University Papers and Problems)			

MULTANI MAL MODI COLLEGE, PATIALA UNIT PLAN Class – MSc I (Semester I) Mathematics				
Subject :- Differential Geometry Subject Teacher :- Dr. Varun Jain			Subject Code:- MM 710 Session :- 2020-21	
S.No.	Syllabus Covered	Reference	Mode of Transactions	Additional Resources*
December 2020				
1	Basic definition and review of Curves in the planes and in space.	Andrew Pressley, Elementary Differential Geometry Chapter 1	Lecture, Discussion	Assignment-I
2	Definition and Arc length, reparametrization, curvature		Lecture	
3	Serret-Frenet formulae.space curves, torsion,	Andrew Pressley, Elementary Differential Chapter 2 Chapter 4	Lecture,	lectures of Prof. Hari Shankar Mahto, Department of Mathematics , IIT Kharagpur (NPTEL) Lecture-1 , Lecture-2
4	osculating circles,evolutes and involutes of curves		Lecture	
5	Theory of Surfaces, smooth surfaces		Lecture	
6	Tangents, Normals and Orientability		Lecture	
7	Quadric surfaces,	Chapter 5	Lecture	
8	First and the second fundamental theorem	Chapters 6 and 7	Lecture	
9	Euler’s theorem, Rodrigue’s formula, Gaussian Curvature	Andrew Pressley, Elementary Differential Geometry Chapter 8	Lecture	
10	Gauss map ,Gaussian and mean curvatures		Lecture	
11	The pseudosphere, flat surfaces		Lecture	
12	Surfaces of constant mean curvature		Lecture	
	(Assignment-I Discussion)			
January 2021				
13	Basic properties of Geodesic, Geodesic equations	Andrew Pressley, Elementary Differential Geometry Chapter 9	Lecture/ Seminar	Assignment-II
14	Geodesics of surfaces of revolution		Lecture	
15	Geodesics as shortest paths, geodesic coordinates.		Lecture	
16	The Gauss and Codazzi–Mainardi equations, Gauss’ remarkable theorem	Andrew Pressley, Elementary Differential Geometry Chapter 10	Lecture	
17	Surfaces of constant Gaussian curvature, Geodesic mappings		Lecture/ Seminar	
18	Minimal Surface and Examples	Andrew Pressley Chapter 12	Lecture	
19	Plateau’s problem		Lecture	
20	Assignment -2 Discussion			
February 2021				

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22	Gauss map of a minimal surface	Andrew Pressley, Elementary Differential Geometry Chapter 12	Lecture	
23	Conformal parametrization of minimal surfaces		Lecture	
24	Minimal surfaces and holomorphic functions		Lecture	
25	Seminar on Important Topics		Lecture and	
²⁶	OLD University Papers and Problems		Discussion	

M. M. Modi College, Patiala

MULTANI MAL MODI COLLEGE, PATIALA

UNIT PLAN

Class- M.Sc.(Math)-I, Sem.-I

Subject: - Introduction to COMPUTER PROGRAMMING USING “C”

Subject Code:-405A

**Subject Teacher:-Dr. Sumeet Kumar
21**

Session:- 2020-

S.No.	Syllabus Covered	Reference	Mode of Transactions	Additional Resources
December 2020				
1	Problem Solving with Computer : Algorithms, and Flowcharts, Program coding, Compilation and execution C character set Data types, constants, variables, arithmetic and logical expressions Data input and output, assignment statements	Yashwant “Let us C” , Sumeet Kumar “Programming in C”	Online	Demo of programs through turbo C Compiler
2	Sizeof operator ,Increment Operator, Decrement Operator , Pre Increment ,Post Increment,bitwise operator	Sumeet Kumar “Programming in C”	Online	Demo of programs through turbo C Compiler
3	Conditional statements , if ,if-else ,switch case default .	Sumeet Kumar “Programming in C”	Online Assignment -1	Demo of programs through turbo C Compiler
January 2021				
4	Loops ,while loop ,do- while loop ,for loop, nested loops,break ,continue	Sumeet Kumar “Programming in C”	Online	Demo of programs through turbo C Compiler
5	Functions, recursion	Sumeet Kumar “Programming in C”	Online	Demo of programs through turbo C Compiler
6	Pointers, Parameter Passing by reference & by value.	Sumeet Kumar “Programming in C”	Online	Demo of programs through turbo C Compiler
7	Arrays, Initialisation of arrays,Pointers, character pointers, pointers to arrays, Array of pointers, String ,String operations	Sumeet Kumar “Programming in C”	Online / PDF Hand Written Notes	Demo of programs through turbo C Compiler

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8	Structures, Union, array of structures, array in structures	Sumeet Kumar "Programming in C"	Online / PDF Hand Notes	Demo of programs through turbo C Compiler
February 2021				
9	Block structures of computer, Computer Characteristics and generations, Problem solving, classification of computer	P.K.Sinha "Computer Fundamentals"	Online, Discussion	Block diagram study with Demo of program through turbo C Compiler
10	RAM, ROM, PROM, EPROM, I/O Devices, Network and types, topologies, communication media, O.S (function, types)	P.K.Sinha "Computer Fundamentals"	Online, Discussion	-
11	Machine language, assembly language, high level language, 4GL, Compiler, Interpreter, Assembler, System Software, Application Software	Sumeet Kumar "Information Technology"	Online, Assignment -1	
12	Seminar on Important Topics		Discussions	
	Discussion (OLD University Papers and Problems)		Discussions	

Subject :- Differentiable Manifolds
Subject Teacher :- Dr. Varun Jain

Subject Code:- MM 601
Session :- 2020-21

S.No.	Syllabus Covered	Reference	Mode of Transactions	Additional Resources
August/September 2020				
1	Definition Differentiable Manifolds, examples of differentiable manifolds.	U.C. De : Differential Geometry of Manifolds Chapter 2	Lecture,	Assignment-1
2	Differentiable maps on manifolds		Lecture	
3	Tangent vectors and tangent space		Lecture	
4	Cotangent space. Lie-bracket of vector fields.		Lecture	
5	Jacobian map, pull back map,		Lecture	
6	Tensors, Exterior product, Forms	U.C. De : Differential Geometry of Manifolds Chapter 3	Lecture	Lectures for Reference by Robert Davie Lecture- 1 , 2
7	Exterior derivative, Contraction		Lecture	
October 2020				
8	Lie-derivative. Affine Connection,	U.C. De : Differential Geometry of Manifolds Chapter-4	Lecture	
9	Difference tensor,		Lecture	
10	Covariant derivative of tensors.		Lecture	
11	Torsion tensor and curvature tensor of a connection,	U.C. De : Differential Geometry of Manifolds Chapter-6	Lecture	
12	Properties of torsion and curvature tensor,		Lecture	

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	Assignment-1- Discussions		Problem session	
November 2020				
13	Bianchi's identities, the Riemannian metric,	U.C. De : Differential Geometry of Manifolds Chapter-7	Lecture/ Seminar	(Assignment -2)
14	Riemannian manifolds,		Lecture	
15	Fundamental theorem of Riemannian geometry,		Lecture	
16	Riemannian connection, Christoffel symbols,		Lecture	
17	Riemannian curvature tensor and its properties.		Lecture/ Seminar	
18	Sectional curvature, Thm of Schur.		Lecture	
December 2020				
19	Sub-manifolds and hyper-surfaces, induced connection,	U.C. De: Differential Geometry of Manifolds Chapter-8	Lecture	Basic lectures for more understanding by Robert Davie Lecture -3
20	Assignment -2		Discussion	
22	Gauss and Weingarten formulae and their applications	U.C. De : Differential Geometry of Manifolds Chapter-8	Lecture	
25	Seminar on Important Topics		Lecture and Discussions	

Subject : Field Theory

Subject Code: MM 602

Subject Teacher : Ms. Rajvinder Kaur

Session : 2020-21

S.No	Syllabus/Topics	Reference	Mode of Transactions	Additional Resources*
August/September 2020				
1	Review of topics :Fields, Irreducible element, Prime Element, PID, UFD, Irreducible Polynomials, Polynomial Ring Gauss Lemma	1. Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra(Chapter-15) 2. Surjeet Singh, Qazi Zameeruddin (Chapter-13)	Lecture, Discussion	Video Lecture By Matthew Macauley, Clems on University
2	Eisenstein Criterion ,Examples related to check irreducibility of Polynomials over Rational Numbers	3. I.N. Herstein(Chapter-5)	Lecture, Discussions	
26	OLD University Papers and Problems			Discussion

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3	Field Extensions, Degree of field, Tower theorem, Adjunction of roots, Kronecker Theorem, Algebraic Extensions, Numerical problems to find degree of algebraic extension		Lecture/Notes	Video Lecture-1 By Matthew Macauley, Clems on University
4	Algebraically closed Fields, Algebraic Closure and theorems related to embedding of field into an algebraically closed field		Lecture, Discussions	Video Lecture-2 By Matthew Macauley, Clems on University
October 2020				
6	Splitting Fields, Uniqueness of splitting Field and Numerical problems to find the splitting Field	1. Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra (Chapter-16) 2. Surjeet Singh, Qazi Zameeruddin (Chapter -13 and 14)	Lecture, Discussions	Assignment-1
7	Normal Extensions, Seperable Extensions, Inseperable Extensions		Lecture	
8	Perfect Field, Finite fields, Primitive Elements, Lagrange's theorem on Primitive Elements, Numerical problems related to primitive element		Lecture, Discussions	
9	Automorphism Groups and Fixed Fields: Dedekind Lemma, Numerical problems related	1. Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra (Chapter-17) 3. I.N. Herstein (Chapter-5)	Lecture	

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	to Galois Group and Fixed field			
10	Assignment-1 Discussions		Seminar/Discussions	
November 2020				
11	Galois extensions, Fundamental theorem of Galois theory, Fundamental theorem of algebra	1.Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra(Chapter-17 and 18) 2. Surjeet Singh, Qazi Zameeruddin (Chapter- 14)	Lecture/Notes	
12	Roots of unity and cyclotomic polynomials. Cyclic extension		Lecture	
13	Radical extension, Solvability by Radicals		Lecture	
14	Problems Related to Galois Theory and Solvability by Radicals		Lecture/Discussions	Assignment-2
December 2020				
15	Symmetric functions, cyclotomic extension, Ruler and Compass construction	1.Bhattacharya, Jain and Nagpaul: Basic Abstract Algebra(Chapter-18) 2. Surjeet Singh, Qazi Zameeruddin(Chapter - 14)	Lecture	
16	Assignment-2 Discussions		Seminar/Discussions	
17	Quintic equation and solvability by radicals	1.M. Artin:Algebra(Chapter16)	Lecture	
18	Seminar and class tests on Important Topics		Seminar/Discussions	
19	Discussion (OLD University Papers			

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	and Problems)			
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M. M. Modi College, Patiala

S.No.	Syllabus Covered	Suggested Reading/ Reference Books	Mode of Transactions	Additional Resources*	
August/September 2020					
1	Review of Linear order differential equations	E.Coddington& N. Levinson, Theory of Ordinary Differential Equations, Tata Mc-Graw Hill;	Lecture	video Lecture through Nptel	
2	Existence and uniqueness of solutions of first order differential equations for complex systems.	ch-1	Lecture	Assignment -I	
3	Maximum and minimum solution		Lecture		
4	Caratheodory theorem.		Lecture		
5	Continuation of solution.		ch-2	Discussion/ Seminar	
October 2020					
6	Uniqueness of solutions	E.Coddington& N. Levinson, Theory of Ordinary Differential Equations; ch-1,2	Lecture		
7	Method of Successive approximations.	E.Coddington& N. Levinson, Theory of Ordinary Differential Equations, Tata Mc-Graw Hill; ch-1,2	Lecture		
8	Problems discussed		Lecture		
9	Variation of Solutions.		Lecture		
10	Assignment -Discussion		Lecture		
November 2020					
11	Review of Partial Differential Equations	Sneddon I.N., Elements of Partial Differential Equations, ch-4	Lecture	Vedio Lecture Through Nptel	
12	Occurrence and elementary solution of Laplace equation. Family of Equi-potential surface.	Sneddon I.N., Elements of Partial Differential	Lecture		

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		Equations, ch-4		
13	Interior and exterior Dirichlet boundary value problem for Laplace equation.	Sneddon I.N., Elements of Partial Differential Equations, ch-4	Lecture	
December 2020				
14	Separation of Variables. Axial symmetry, Kelvin's inversion theorem.	Sneddon I.N., Elements of Partial Differential Equations, ch-4	Lecture	<u>Assignment</u>
15	Green's function for Laplace equation. Dirichlet's problem for semi-infinite space and for a sphere. Copson's Theorem (Statement only)	Sneddon I.N., Elements of Partial Differential Equations, ch-4	Lecture	
16	Discussion (OLD University Papers and Problems)			

M. M. Modi College, Patiala

UNIT PLANNING

Subject Teacher : Dr. Anu Bala
2020-21

Session :

S.No.	Syllabus Covered	Suggested Reading/ Reference Books	Mode of Transactions	Additional Resources*
August-September 2020				
1	Basic Principles: Mechanics of a Particle and a System of Particles, Constraints.	Herbert Goldstein: Classical Mechanics. (Chapter 1)	Lecture, Discussion	
2	Generalized Coordinates, Holonomic and Non-Holonomic Constraints.		Lecture, Discussion	Video Lecture by Prof. Charudatt Kadolkar (IIT Guwahati)
3	D'Alembert's Principle and Lagrange's Equations, Velocity Dependent Potentials and the Dissipation Function.		Lecture, Discussion	Video Lecture by Prof. Charudatt Kadolkar (IIT Guwahati)
4	Simple Applications of the Lagrangian formulation.		Lecture, Discussion	
5	Variational Principles and Lagrange's Equations: Hamilton's Principle, Derivation of Lagrange's Equations from Hamilton's Principle.	Herbert Goldstein: Classical Mechanics. (Chapter 2)	Lecture, Discussion	Video Lecture by Prof. Charudatt Kadolkar (IIT Guwahati)
6.	Extension of Hamilton's Principle to Non-Holonomic Systems.			
October 2020				
7	Conservation Theorems and Symmetry Properties: Cyclic Coordinates, Canonical Momentum and its Conservation, The Generalized Force, and Angular Momentum Conservation Theorem.	Herbert Goldstein: Classical Mechanics. (Chapter 2)	Lecture, Discussion	
8	The Two-Body Central Force Problem: Reduction to the Equivalent One-Body Problem.	Herbert Goldstein: Classical Mechanics. (Chapter 3)	Lecture, Discussion	

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9	The Equation of Motion, The Equivalent One Dimensional Problem and the Classification of Orbits.		Lecture, Discussion	
10	The Virial Theorem, Conditions for Closed Orbits, Bertrand's Theorem.		Lecture, Discussion	
November 2020				
11	The Kepler Problem: Inverse Square Law of Force, The Motion in Time in the Kepler Problem.	Herbert Goldstein: Classical Mechanics. (Chapter 3)	Lecture, Discussion	Video Lecture by Prof. Charudatt Kadolkar (IIT Guwahati)
12	Kepler's Laws, Kepler's Equation, The Laplace-Runge-Lenz Vector.		Lecture, Discussion	Assignment - I
13	Scattering in a Central Force Field: Cross Section of Scattering, Rutherford Scattering Cross Section.		Lecture, Discussion	
14	Total Scattering Cross Section, Transformation of the Scattering Problem to Laboratory Coordinates.		Lecture, Discussion	
December 2020				
15	The Kinematics of Rigid Body Motion: The Independent Coordinates of Rigid Body, The Transformation Matrix, The Euler Angles, The Cayley-Klein Parameters and Related Quantities.	Herbert Goldstein: Classical Mechanics. (Chapter 4)	Lecture, Discussion	
16	Euler's Theorem on the Motion of Rigid Bodies, Finite Rotations, Infinitesimal Rotations, The Coriolis Force.		Lecture, Discussion	
17	Seminar on Important Topics		Lecture, Discussion	
18	Discussion (Old University Question Papers and		Lecture,	

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	Problems)		Discussion	
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*Demonstration/case study/suggested reading links/images/animations/pdf/ppt etc.

Subject :-OPTIMIZATION TECHNIQUES-I			Subject Code:-MM 609	
Subject Teacher :- Chetna Rani Gupta			Session :- 2020-21	
S.No.	Syllabus Covered	Reference	Mode of Transactions	Additional Resources*
August/September 2020				
1	Review of Linear Programming:	Kanti Swarup,P.K. Gupta,Man Mohan: <i>operation Research</i> ,Sultan Chand &Sons (chapter 0&1)	Lecture, discussion	Video lecture LPP by Prof Kusumdeep Gupta IIT Roorkee Viedo lecture Duality Prof Kusumdep Gupta IIT Rorkee
2	Simplex method, Big M Method	Kanti Swarup,P.K. Gupta,Man Mohan: <i>operation Research</i> ,Sultan Chand &Sons (chapter 2&3)		
October 2020				
3	Two Phase method	Kanti Swarup,P.K. Gupta,Man Mohan: <i>operation Research</i> ,Sultan Chand &Sons (chapter 4)		Assignment :Simplex
4	Concept of duality	Kanti Swarup,P.K. Gupta,Man Mohan: <i>operation Research</i> ,Sultan Chand &Sons (chapter 5)	Lecture, discussion	Assignment :Duality Assignment: Dual Simplex

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5	Sensitivity Analysis: Discrete changes in the cost vector Discrete changes in requirement vector Discrete changes in co-efficient matrix Addition of a new variable Deletion of a variable Addition of new constraint Deletion of a constraint.	Kanti Swarup, P.K. Gupta, Man Mohan: <i>operation Research</i> , Sultan Chand & Sons (chapter 6)	Lecture, discussion	Assignment : Sensitivity Analysis
6	Integer Programming: Introduction Gomory's all-IPP method Gomory's mixed-integer method Branch and Bound method.	Kanti Swarup, P.K. Gupta, Man Mohan: <i>operation Research</i> , Sultan Chand & Sons (chapter 7)	Lecture, discussion	Assignment : IPP
7	Dynamic Programming: Introduction, The recursive equation approach, Dynamic Programming Algorithm, Solution of Discrete DPP.	Kanti Swarup, P.K. Gupta, Man Mohan: <i>operation Research</i> , Sultan Chand & Sons (chapter 13)	Lecture, discussion	
November 2020				
8	Transportation Problem: Introduction, mathematical formulation of the problem Initial basic feasible solution using North West Corner Method, Least Cost Method and Vogel's Approximation Method Optimal solution using MODI method Degeneracy in transportation problems Some exceptional cases in transportation problems	Kanti Swarup, P.K. Gupta, Man Mohan: <i>operation Research</i> , Sultan Chand & Sons (chapter 10)	Lecture, discussion	video lecture Transportation by Prof Kusumdeep Gupta IIT Rorkee
9	Assignment Problems: Introduction Mathematical formulation of an assignment problem Assignment algorithm Unbalanced assignment problems Travelling Salesman problem	Kanti Swarup, P.K. Gupta, Man Mohan: <i>operation Research</i> , Sultan Chand & Sons (chapter 11)	Lecture, discussion	Video lecture Assignment by Prof Kusumdeep Gupta IIT Rorkee Assignment : Transportation & Assignment

UNIT PLANNING

December 2020				
10	Games & Strategies: Definition & characteristics of Games Two person zero sum games Maximin-minimax principle Games without saddle points Mixed Strategies Graphical method for solving and games, Concept of Dominance Reducing the game problem to LPP Limitations	Kanti Swarup, P.K. Gupta, Man Mohan: <i>operation Research</i> , Sultan Chand & Sons (chapter 17)	Lecture, discussion	Video lecture Game theory by Prof Kusumdeep Gupta IIT Rorkee Assignment :Game
11	Seminar on Important Topics			
12	Discussion (Previous University Papers and Problems)			

M. M. Modi College, Patiala