Syllabus

MAT-75T-301- Abstract Algebra & Three Dimensional Geometry

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
V	MAT-75T-301	Abstract Algebra & Three Dimensional Geometry			7	6
Level of Course	Type of the Course	Credit Distribution			Course Delivery Method	
		Theory	Practical	Total		
High Level Course	MJR	6	0	6	Lectures	

Regular Students-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Theory	MAT-75T-301 Abstract Algebra & Three Dimensional Geometry	CA- 1Hrs EoSE -3Hrs	CA- 30 Marks EoSE- 120 Marks	CA- 12 Marks EoSE-48 Marks

Objectives of the Course:	The objective of the course on Group Theory, Ring Theory, and three dimensional geometry, as outlined in the syllabus, is to provide students with a thorough understanding of fundamental algebraic structures, their applications and basic three dimensional geometrical shapes.

30.7.25

Detailed Syllabus

[UG0102-MAT-75T-301] - [Abstract Algebra & Three Dimensional Geometry]

Unit - I

Binary operations, Algebraic structure, Groups, Order of group, finite and infinite order groups and their order specific theorems, Subgroups and their properties, Permutation group, Cyclic group. Cosets, Lagrange's theorem.

(22 Lectures)

Unit - II

Morphism of groups, Cayley's theorem. Normal subgroups and Quotient groups. Fundamental theorems of Homomorphism.

(23 Lectures)

Unit -III

Definition and simple properties of Rings and Subrings. Morphism of rings. Integral domain and field. Characteristics of a Ring and Field.

(22 Lectures)

Unit-IV

Sphere: Equation of Sphere, Plane section of sphere, intersection of a sphere by a line, tangent line and tangent plane of a sphere, angle of intersection of two spheres. Cone: Equation of cone, tangent plane of a cone, right circular cone, enveloping cone. Cylinder: Equation of cylinder, enveloping cylinder, right circular cylinder.

(23 Lectures)

Suggested Books and References –

1. Kenneth Hoffman, Ray Alden Kunze, Linear Algebra 2nd Ed., Prentice-Hall Of India Pvt. Limited, 1971.
2. I.N.Herstein, Topics in Algebra, Wiley-Eastern Ltd., New Delhi.
3. Joseph A. Gallian, Contemporary Abstract Algebra (4th Edition), Narosa Publishing House, New Delhi, 1999.(IX Edition 2010).
4. N.S.Gopalkrishnan, University Algebra, New Age International, 1986.
5. G.C.Sharma, Modern Algebra, Shivlal Agrawal & Co., Agra,1998.
6. S.L. Loney, The Elements of Coordinate Geometry, Macmillan and co. London, 1895.
7. R.J.T. Bell, Elementary Treatise on Co-ordinate geometry of three dimensions, Macmillan India Ltd., 1994.

Sita Meena

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4/10/2024

Syllabus

MAT-76T-302- Complex Analysis & Mechanics

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
VI	MAT-76T-302	Complex Analysis & Mechanics			7	6
Level of Course	Type of the Course	Credit Distribution			Course Delivery Method	
		Theory	Practical	Total		
High Level Course	MJR	6	0	6	Lectures	

Regular Students-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Theory	MAT-76T-302 Complex Analysis & Mechanics	CA- 1Hrs EoSE -3Hrs	CA- 30 Marks EoSE- 120 Marks	CA- 12 Marks EoSE-48 Marks

Objectives of the Course:	The objective of the course is to enable students to understand and apply complex analysis, principles of equilibrium and work, and solve mechanical motion problems.

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Detailed Syllabus

[UG0102-MAT-76T-302] - [Complex Analysis & Mechanics]

Unit - I

Complex valued function: Limits, Continuity and Differentiability. Analytic functions, Cauchy-Riemann equations. Harmonic functions, Construction of an analytic function. Complex integration, Complex line integrals, Cauchy integral theorem, Indefinite integral, Fundamental theorem of integral calculus for complex functions. Cauchy integral formula, Analyticity of the derivative of an analytic function.

(22 Lectures)

Unit - II

Taylor's theorem. Laurent's theorem. Maximum modulus theorem. Singularities of an analytic function, Branch point, Meromorphic and Entire functions, Residue at a singularity, Cauchy's residue theorem.

(23 Lectures)

Unit -III

Velocity and acceleration – along radial and transverse directions, along tangential and normal directions, Motion in resisting medium – Resistance varies as velocity and square of velocity, Motion on a smooth curve in a vertical plane.

(22 Lectures)

Unit-IV

Equilibrium of coplanar forces, moments, Friction, Virtual Work and catenary.

(23 Lectures)

Suggested Books and References –

1. Brown JW, Churchill RV. Complex variables and applications. McGraw-Hill,; 2009.
2. Kasana HS. Complex variables: theory and applications. PHI Learning Pvt. Ltd.; 2005.
3. Ponnusamy S, Silverman H. Complex variables with applications. Springer Science & Business Media; 2007.
4. A.S.Ramsey, Statics, CBS Publishing & Distributors, New Delhi.
5. M. Ray, A Text Book of Dynamics, S. Chand & Co., 2003.
6. J.L. Synge & B.A. Griffith - Principles of Mechanics, Tata McGraw-Hill, 1959.
7. R.C. Hibbeler and Ashok Gupta, Engineering Mechanics: Statics and Dynamics (11th Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi.

Suggested E-resources:

1. Online Lecture Notes and Course Materials

Course Learning Outcomes:

By the end of the course, students would have achieved the following:

1. Grasped the concepts of Taylor's and Laurent's theorems as they apply to complex functions.
2. Conducted analysis on the singularities of analytic functions, including branch points, meromorphic functions, entire functions, and residues at singularities using the Cauchy residue theorem.
3. Understand and calculate velocity and acceleration in various directions and analyze motion in resisting

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media.

4. Analyze the equilibrium of coplanar forces, calculate moments, and understand the effects of friction.
5. Apply the principles of virtual work to mechanical systems and analyze motion on smooth curves in vertical planes.
6. Mathematical treatment to the configuration called Catenary.