

Semester-I

Course Code: MTH-404

Course Name: **Abstract Algebra**

Instructor Name: Dr. K. Srivastava

Credit Equivalent: 04 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars, etc.)

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must, failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
 - i) Assignments 20%
 - ii) Class participation 5%

Course Contents:

Unit I

Laws of Composition, Groups and Subgroups, Examples of Groups and Subgroups, Groups generated by a Set, Cyclic Groups, Order of an element of a Group, Cosets, Lagrange's theorem, Index of a Subgroup, Cycle decomposition of a Permutation. Homomorphisms, Isomorphisms, Automorphisms, Normal Subgroups, Quotient Groups, The Isomorphism theorems, the Correspondence Theorem, Direct Product of Groups.

Unit II

Group Actions, Examples of Group Actions, Orbit and Stabilizer of Group Action, Orbit and Stabilizer Formula, Cayley's theorem, Conjugacy Classes, Center of a Group, Centralizer of a Subset, the Class Equation, Application of the Class Equation, the Center of a p-Group and related results, Simple Groups.

Unit III

Stabilizer and Normalizer of a Subgroup, the First Sylow theorem, the Second Sylow theorem, the Third Sylow theorem. Applications of Sylow Theorems, Definition of a Ring, Examples of Rings, Subrings, Homomorphisms of Rings, Kernel of a Homomorphism, Ideals, Ideal Generated by a Set, Principal Ideals.

Unit IV

Quotient Ring, Prime Ideals, Maximal Ideals, the Isomorphism theorems for Rings, the Universal Mapping Property of Quotient Rings, The Correspondence theorem, Direct Product Rings, Integral Domains, Group of Units of a Ring, Associates, Irreducible Elements of Ring, Prime Elements of a Ring, Unique Factorization Domains, An Example of a Non-Unique Factorization Domain.

Prescribed Texts

(1) I.M. Isaacs, Algebra: A Graduate Course, AMS (Graduate Studies in Mathematics), Indian Edition.

(2) Michael Artin, Algebra, Second Edition, PHI

(3) Nathan Jacobson, Basic Algebra, Vol. 1, Hindustan Publishing Corporation, Delhi

Additional Text

(1) David S. Dummit and Richard M. Foote, Abstract Algebra, Third Edition, Wiley India

Course Code: IAM-401

Course Name: Complex Analysis

Credit-4

Instructor Name: Dr. S. K. Srivastava

Credits Equivalent: 04 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Attendance Requirements:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Counselling, Activities and Tutorials (CAT): 25%
 - i. Subjective / Objective Assignment: 20 %
 - ii. Presentations and Class Tests: 5 %

Course Contents:

UNIT-I: Complex Numbers, Geometric description, Stereographic projection, Analytic functions, the Cauchy-Riemann equations, Multivalued functions, Branch point. [10 Lectures]

UNIT-II: Complex integration, Cauchy-Goursat theorem, Cauchy integral formula, Derivatives of analytic function [10 Lectures]

UNIT-III: The Liouville theorem, The Morera theorem, Maximum-Modulus theorem, Conformal transformations. [10 Lectures]

UNIT-IV: Taylor's series, Laurent's series, Singularities of complex functions, the Cauchy Residue theorem, Evaluation of integrals. [10 Lectures]

Prescribed text book:

J. B. Conway, Functions of one complex variable, International Student-Edition, Narosa Publishing House, 2000.

Reference books:

1. K. Kodaira, Complex Analysis, Cambridge University Press, 2007.
2. J. W. Brown and R. V. Churchill, Complex Variables and Applications, McGraw-Hill, 8th Edition, 2008.

Course Code: MTH 401

Course Name: ORDINARY DIFFERENTIAL EQUATIONS

Instructor Name: Dr. R. Kumar & Tanya Sharma

Credits Equivalent: 04 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity /contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Course Objective: The purpose of this course is to acquaint the students with elementary differential equations.

Attendance Requirements:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Counselling, Activities and Tutorials (CAT): 25%
 - i. Subjective / Objective Assignment: 20 %
 - ii. Presentations and Class Tests: 5 %

Course Contents:

Unit I: Existence and uniqueness theory; dependence of solutions on initial conditions and on the function; existence and uniqueness theorems for systems and higher order equations.

Unit II: The theory of linear differential equations; homogeneous and non-homogeneous systems, nth order homogeneous and non-homogeneous linear differential equations.

Unit III: Sturm theory, Sturm-Liouville boundary value problems.

Unit IV: Nonlinear differential equations; phase plane, critical points and paths (linear and nonlinear systems), limit cycles and periodic solutions.

Prescribed Text Books:

1. Ross S.L. (1984). Differential Equations. Third Edition. John Wiley & Sons Inc.

Suggested Additional Readings:

1. W.E. Boyace and R.C. Diprima (2013). Elementary Differential Equations and Boundary Value Problems, Ninth Edition, Wiley.
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Course Code: MTH 403

Course Name: LINEAR ALGEBRA

Credits: 04

Name of Teacher: Dr. Rakesh Kumar

Credits Equivalent: 04 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity /contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Course Objective: The purpose of this course is to acquaint the students with the Numerical analysis which is necessary to develop the basic understanding of numerical algorithms for solving problems in science, engineering and technology.

Attendance Requirements:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of

75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
 - i) Assignments 20%
 - ii) Class participation 5%

Course Contents:

Unit I: Vector Spaces, Subspaces, Basis and dimension, Linear Transformations, Quotient spaces, Direct sum, The matrix of a linear transformation, Duality

Unit II: Eigenvalues and eigenvectors, Annihilating polynomials, Invariant subspaces, Triangulation and diagonalization.

Unit III: Canonical Forms, Jordan Form, Inner Product Spaces, orthonormal basis, Linear functional and adjoints .

Unit IV: Bilinear Forms, Definition and examples, Symmetric and skew-symmetric bilinear forms.

Prescribed Text Book:

1. K. Hoffman and R. Kunze : Linear Algebra, Second Edition, Pearson, 2015.

Suggested Additional Readings:

1. G. Strang: Linear Algebra and its applications, 4th Edition, CENGAGE LEARNING, 2007.
2. S. Kumaresan: Linear Algebra, A Geometric approach, Prentice Hall of India, 2000.
3. S. Lipschutz and M. L. Lipson: Linear Algebra, 3rd Edition, McGraw Hill Education India, Pvt. Ltd., 2001.
4. H. Anton and C. Rorres: Elementary Linear Algebra, 11th Edition, Wiley, 2014.

Skill Development

Course Name: Vedic Mathematics

Course Code: IAM 412

Credit: 02

Course Objective: The purpose of this course is to acquaint the students with the quicker arithmetic techniques to solve problems.

Course Contents:

Unit I: Number system, binary system, permutation combination, probability.

Unit II: Ratio and proportion, partnership, percentage, average, profit and loss, allegation, time and work, time and distance.

Prescribed Text Book:

M. Tyra, Quicker Maths, BSC Publishing Co. Pvt. Ltd. Delhi, 2017.

Suggested reading:

J. Sankaracarya, Vedic Mathematics, Motilal Banarsidass Publishers Delhi 2015.
