GOVERNMENT COLLEGE ISRANA (PANIPAT)
LESSON PLAN
(February 2025 to May 2025)

Name of the Assistant Professor: Dr Prateek Mor
Class: M.Sc 2nd Semester – 4th
Subject: Mathematics
Paper: Boundary Value Problems

February 2025	**Unit 1:**	Applications to Ordinary Differential Equations; Initial value problems, Boundary Value Problems. Dirac Delta functions. Green's function approach to reduce boundary value problems of a self-adjoint differential equation with homogeneous boundary conditions to integral equation forms. Green's function for N*th* -order ordinary differential equation. Modified Green's function. Problems discussion and revision of unit 1.
March 2025	**Unit 2:**	Applications to partial differential equations: Integral representation formulas for the solution of the Laplace and Poisson Equations. The Newtonian, single-layer and double layer potentials, Interior and Exterior Dirichlet problems, Interior and Exterior Neumann problems. Green's function for Laplace's equation in a free space as well as in a space bounded by a ground vessel. Integral equation formulation of boundary value prolems for Laplace's equation. Poisson's Integral formula. Green's function for the space bounded by grounded two parallel plates or an infinite circular cylinder. The Helmholtz equation. Problems discussion and revision of unit 2.
April 2025	**Unit 3:**	Integral Transform methods: Introduction, Fourier transform. Laplace transform. Convolution Integral. Application to Volterra Integral Equations with convolution-type Kernels. Hilbert transform. Applications to mixed Boundary Value Problems: Two-part Boundary Value problems, Three-part-Boundary Value Problems, Generalized Three-part Boundary Value. problems. Problems discussion and revision of unit 3.
May 2025	**Unit 4:**	Integral equation perturbation methods: Basic procedure, Applications to Electrostatics, Low-Reynolds-Number Hydrodynamics: Steady stokes Flow, Boundary effects on Stokes flow, Longitudnal oscillations of solids in stokes Flow, Steady Rotary Stokes Flow, Rotary Oscillations in Stokes Flow, Rotary Oscillation in Stokes Flow, Oseen Flow-Translation Motion, Oseen Flow-Rotary motion Elasticity, Boundary effects, Rotation, Torsion and Rotary Oscillation problems in elasticity, crack problems in elasticity, Theory of Diffraction. Problems discussion and revision of unit 4.

Books Recommended:

1. R.P.Kanwal, Linear Integral Equations, Theory and Techniques, Academic Press, New York.
2. S.G.Mikhlin, Linear Integral Equations (translated from Russian) Hindustan Book Agency, 1960.
3. I.N.Sneddon, Mixed Boundary Value Problems in potential theory, North Holland, 1966.
4. I, Stakgold, Boundary Value Problems of Mathematical Physics Vol.I, II, Mac.Millan, 1969.
5. Pundir and Pundir, Integral equations and Boundary value problems, Pragati Prakashan, Meerut.

GOVERNMENT COLLEGE ISRANA (PANIPAT)
LESSON PLAN
(February 2025 to May 2025)

Name of the Assistant Professor: Dr Prateek Mor
Class: M.Sc 2nd Semester – 4th
Subject: Mathematics
Paper: Algebraic Number Theory

February 2025	**Unit 1:**	Algebraic numbers and algebraic integers. Transcendental Numbers. Liouville's Theorem for real Algebraic numbers. Thue Theorem and Roth's theorem (statement only). Algebraic numberfield K. Theorem of Primitive elements. Liouville's Theorem for complex algebraic numbers. Minimal polynomial of an algebraic integer. Primitive m-th roots of unity. Cyclotomic Polynomials. Norm and trace of algebraic numbers and algebraic integers. Bilinear form on algebraic number field K. Problems discussion and revision of unit 1.
March 2025	**Unit 2:**	Integral basis and discriminant of an algebraic number field. Index of an element of K. Ring Ok of algebraic integers of an algebraic number field K. Ideals in the ring of algebraic number field K. Integrally closed domains. Dedekind domains. Fractional ideals of K. Factorization of ideals as a product of prime ideals in the ring of algebraic integers of an algebraic number field K. G.C.D. and L.C.M. of ideals in Ok. Chinese Remainder theorem. Problems discussion and revision of unit 2.
April 2025	**Unit 3:**	Different of an algebraic number field K. Dedekind theorem. Euclidean rings. Hurwitz Lemma and Hurwitz constant. Equivalent fractional ideals. Ideal class group. Finiteness of the ideal class group. Class number of the algebraic number field K. Diophantine equations Minkowski's bound. Problems discussion and revision of unit 3.
May 2025	**Unit 4:**	Quadratic reciprocity Legendre Symbol. Gauss sums. Law of quadratic reciprocity. Quadratic fields. Primes in special progression. Problems discussion and revision of unit 4.

Books Recommended:

1. Paulo Ribenboim Algebraic Numbers
2. R. Narasimhan and S. Raghavan Mathematical Algebraic Number Theory

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LESSON PLAN
(February 2025 to May 2025)

Name of the Assistant Professor: Dr Prateek Mor
Class: M.Sc 2nd Semester – 4th
Subject: Mathematics
Paper: Mathematical Aspects of Seismology

February 2025	**Unit 1:**	General form of progressive waves, Harmonic waves, Plane waves, the wave equation. Principle of superposition. Special types of solutions: Progressive and Stationary type solutions of wave equation. Equation of telegraphy. Exponential form of harmonic waves. D' Alembert's formula. Inhomogeneous wave equation. Dispersion: Group velocity, relation between phase velocity and group velocity. Problems discussion and revision of unit 1.
March 2025	**Unit 2:**	Reduction of equation of motion to wave equations. P and S waves and their characteristics. Polarisation of plane P and S waves. Snell's law of reflection andrefraction. Reflection of plane P and SV waves at a free surface. Partition of reflected energy. Reflection at critical angles. Reflection and reflection of plane P,SV and SH waves at an interface. Special cases of Liquid-Liquid interface, Liquid-Solid interface and Solid-Solid interface. Rayleigh waves, Love waves and Stoneley waves. Problems discussion and revision of unit 2.
April 2025	**Unit 3:**	Two dimensional Lamb's problems in an isotropic elastic solid: Area sources and Line Sources in an unlimited elastic solid. A normal force acts on the surface of a semi-infinite elastic solid, tangential forces acting on the surface of a semi-infinite elastic solid. Three dimensional Lamb's problems in an isotropic elastic solid: Area sources and Point sources in an unlimited elastic solid, Area source and Point source on the surface of semiinfinite elastic solid. Haskell matrix method for Love waves in multilayered medium. Problems discussion and revision of unit 3.
May 2025	**Unit 4:**	Spherical waves. Expansion of a spherical wave into plane waves: Sommerfield's integral. Kirchoff's solution of the wave equation, Poissons's formula, Helmholtz's formula. Problems discussion and revision of unit 4.

Books Recommended:

1. P.M.Shearer, Introduction to Seismology, Cambridge University Press,(UK) 1999.
2. C.M.R.Fowler, The Solid Earth, Cambridge University Press, 1990.
3. C.A.Coulson and A.Jefferey, Waves, Longman, New York, 1977.
4. M.Bath, Mathematical Aspects of Seismology, Elsevier Publishing Company, 1968.
5. W.M.Ewing, W.S.Jardetzky and F.Press, Elastic Waves in Layered Media, McGraw Hill Book Company, 1957.

GOVERNMENT COLLEGE ISRANA (PANIPAT)
LESSON PLAN
(February 2025 to May 2025)

Name of the Assistant Professor: Dr Prateek Mor
Class: M.Sc 1st Semester – 2nd
Subject: Mathematics
Paper: Advanced Abstract Algebra

February 2025	**Unit 1:**	Irreducible polynomials, Eisenstein criterion, Gauss lemma. Field extension, algebraic and transcendental extension, degree of an extension, algebraic closure and algebraically closed field. Problems discussion and revision of unit 1.
March 2025	**Unit 2:**	Splitting field, degree of extension of splitting field. Normal extension, multiple roots, prime field, characterization of prime field, finite field, separable extension. Problems discussion and revision of unit 2.
April 2025	**Unit 3:**	Automorphism group, fixed field, Dedekind lemma, Galois groups of polynomials, Galois extension, fundamental theorem of Galois theory, fundamental theorem of algebra, roots of unity. Cylotomic polynomials, Klein's four group, cyclic extension, Frobenius automorphism of a finite field. Problems discussion and revision of unit 3.
May 2025	**Unit 4:**	Solvability of polynomials by radicals over Q. Symmetric functions and elementary symmetric functions. Construction with ruler and compass only. Problems discussion and revision of unit 4.

Books Recommended:

1. P. B. Bhattacharya, S. K. Jain, S. R. Nagpaul, Basic Abstract Algebra (Second edition), Cambridge University Press, 2012.
2. Vivek Sahai and Vikas Bist, Algebra, Narosa Publishing House, 1999.
3. Surjit Singh and Quazi Zameeruddin, Modern Algebra, Vikas Publishing House, 1990.
4. Patrick Morandi, Field and Galois Theory, Springer 1996.