Subject : Mathematics

Teacher name: Nitika Semester 4th

Name of the Paper : Paper 2

Class: MSc(Mathematics)

April 2021

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| PDE of kth order: Definition, examples and classifications. Initial value problems. Transport equations homogeneous and non-homogeneous, Radial solution of Laplace’s Equation: Fundamental solutions, harmonic functions and their properties, Mean value Formulas, Poisson,s equation and its solution, strong maximum principle, uniqueness, local estimates for harmonic functions, Liouville,s theorem, Harnack’s inequality.  |

May 2021

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| Green’s function and its derivation, representation formula using Green’s function, symmetry of Green’s function, Green’s function for a half space and for a ball. Energy methods: uniqueness, Drichlet’s principle. Heat Equations: Physical interpretation, fundamental solution. Integral of fundamental solution , solution of initial value problem, Duhamel’s principle, non-homogeneous heat equation, Mean value formula for heat equation, strong maximum principle and uniqueness. Energy methods |

June 2021

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| Wave equation- Physical interpretation, solution for one dimentional wave equation, d’Alemberts formula and its applications, reflection method, Solution by spherical means EulerPoisson\_Darboux equation, Kirchhoff’s and Poisson’s formulas (for n=2, 3 only), Solution of non –homogeneous wave equation for n=1,3. Energy method. Uniqueness of solution, finite propagation speed of wave equation. Non-linear first order PDE- complete integrals, envelopes, Characteristics of (i) linear, (ii) quasilinera, (iii) fully non-linear first order partial differential equations. Hamilton Jacobi equations (calculus of variations Hamilton’s ODE, Legendre Transform, Hopf-Lax formula, weak solutions, Uniqueness).  |

July 2021

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| Conservative Laws (Shocks, entropy condition, Lax-Oleinik formula., weak solutions uniqueness. Riemann’s problem, long time behaviuor). Representation of Solutions- Separation of variables, Similarity solutions (Plane and traveling waves, solitones, similarity under Scaling). Fourier Transform, Laplace Transform, Converting non linear into linear PDE, Cole-Hop Transform, Potential functions, Hodograph and Legendre transforms. |