DEPARTMENT OF APPLIED MATHEMATICS

FACULTY OF ENGG. & TECH.,

M.J.P.R.U., BAREILLY.

Syllabus of Pre-Ph.D. course work

in

Mathematics

2020-21.

Syllabus of Pre-Ph.D. course work

in

Mathematics

PAPER-I :Research Methodology (Core Mathematics)

Unit-1:- **Advanced Algebra:**

Linear transformation, rank and nullity, Dual space and dual basis, Diagonalizable operators. Inner product space, Schwarz's and Cauchy's inequalities, Orthogonalisation process.

Unit-2:- **Calculus of Variation:**

Functional, Euler's equations, Necessary and Sufficient condition for extremals, variation problems with constraint conditions, moving boundaries with transversality condition, field of extremals and varied path.

Unit-3:- **Real Analysis:**

Riemann Stieltjes Integral, Integration and differentiation, Fundamental theorem of calculus, Uniform convergence of series and sequence of functions.

Unit-4:- Complex Analysis:

Cauchy integral formula and consequences, singularities, residue theorem, argument principle, Rouche's theorem.

Reference Books:-

1. J.B. Fraleigh :A First course in Abstract Algebra, Narosa Publishing House, New Delhi.
2. L.V. Ahlfors :Modern Algebra, McGraw-Hill, Inc.1996.
3. S.G. Krantz :Complex Analysis: the geometric view points, second edition, Carus math. Monograph. MAA
4. W. Rudin :Principles in Mathematical Analysis(3rd edition), McGraw –Hill, Kogakusha, International Student Edition.
5. R.V. Churchill : Complex variable and Application, McGraw –Hill.
6. F.B. Hildbrand : Method of Applied Mathematics, PHI, India.

Syllabus of Pre-Ph.D. course work

in

Mathematics

PAPER-II : Applied Mathematics

Unit-1:-Ordinary Differential Equations :

System of linear equations, existence and uniqueness theorem, stability theorem. Linearization of first order non-linear equations- Riccati equations, Abel equation.

Unit-2:- Partial Differential Equations :

Classification and properties of second order linear equations in two independent variables, four independent variables; canonical forms.

Unit-3:- Integral Equations :

Relation between integral equations and differential equations. Main techniques of solving linear integral equations – Fredholm eqn., Volterra eqn.

Unit-4: Mathematical Modelling:

Need, Characteristics, Classification and limitation of mathematical modelling. Some illustrative examples of modelling through

(a) Differential equations,

(b) Dynamic Programming.

Reference Books:-

1. G.F. Simmons : Differential equations with applications and Historical notes, second edition, Tata Mc Graw-Hill publishing company Ltd., New Delhi.
2. P.L. Sachdev : Non-linear ordinary differential equations, Marcel Dekker, Inc, NY.
3. I.N. Sneddon: : Elements of Partial differential equation, Mc Graw-Hill Book Company.
4. Shanti Swaroop : Integral equations, Krishna Prakashan Media (P) Ltd, Meerut.
5. J.N. Kapoor : Mathematical Modelling, New Age International limited, New Delhi.
6. H.A. Taha : Operations Research- An Introduction, Mac Millan Publishing Co. Inc, NY.

Syllabus of Pre-Ph.D. course work

In

Mathematics

PAPER-III: Review of Literature (Mathematics)

Identification of problem and its solutions :

Students have to develop annotated bibliography on and around the theme of research which must cover at least 10 books OR reviewing of at least 20 research papers in the relevant field , published in reputed/refereed/Scopus/UGC listed Journals.