COURSE OUTCOME OF Ph. D COURSE WORK
IN
MATHEMATICS
2021
DEPARTMENT OF MATHEMATICAL SCIENCES
BODOLAND UNIVERSITY, KOKRAJHAR
BTC, ASSAM

Paper-I: Research Methodology [Total Marks 100(80+20)]
Paper-II: Computer Application [Total Marks 100(80+20)]
Paper-III: Overview on relevant Subject Paper [Total Marks 100 (80 For Dissertation) + 20 (For Seminar Presentation)]
Paper-IV: In depth of the relevant Subject Paper/Research area [Total Marks 100(80+20)]
Paper-V: Research and Publication Ethics

Course Outcome

Paper I: Research Methodology

Research Methodology

Course Outcome

Upon completion of this course, students will be able to

(i) analyze purpose of research methodology, objectives and motivation of research, phases of research, research approaches and related tools, conditions and criteria for good research.
(ii) formulate research problem, preparation of research article and thesis
(iii) write research proposals, define the concrete research problem and focusing on it, techniques involved in defining a problem, importance of communication skill in research, development of power of expression in both speaking and writing, mastery of presentation techniques.
(iv) prepare progress report, understand research ethics and morals issues related to plagiarism, collaborative models and ethics, acknowledgements, intellectual property rights.

Paper II: Computer Application

Computer Application

Course Outcome

Upon completion of this course, students will be able to

(i) use Microsoft Office: word processing and preparation of documents. Power Point presentation and preparation of documents, Excel in data analysis, Editing and formatting worksheets.
(ii) use Spreadsheets, SPSS, R-Language, Basics of SciLab & Python.
(iv) produce and prepare Mathematical documents using Microsoft-Words, Math type and Latex.
(v) produce simple documents using LATEX, produce Mathematical equations and formulae using LATEX, write article and thesis in LATEX.

Paper-III: Overview on relevant Subject Paper

Course Outcome

Upon completion of this course, students will be able to

(i) analyse a research paper on relevant field.
(ii) review a research paper by finding drawbacks and improving the research paper on relevant field.
(iii) write a new research paper, dissertation, thesis etc.

Paper-IV: In depth of the relevant Subject Paper/Research Area

Any one from the following Papers:

   a   **Relativistic Cosmology**

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Relativistic Cosmology

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Course Outcome

Upon completion of this course, students will be able to

(i) become acquainted with the mathematical and physical structures of Einstein's equations, as well as the basic analytical skills required to solve them in order to describe the early universe's evolution.
(ii) understand the key steps that lead to the recognition of the expanding Universe and understand the physical implications of cosmological expansion.
(iii) account for the theoretical basis for our modern cosmological view of the universe, beginning with the Big Bang and progressing to early galaxy formation.
(iv) account for the most recent observational findings in cosmological research, and provide insight into current issues.

   b   *L*-**Fuzzy Topology**

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L-**Fuzzy Topology**

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Course Outcome

Upon completion of this course, students will be able to

(i) explain properties of fuzzy sets, Compare fuzzy set systems with classical set theory. Several approaches towards the definitions of fuzzy topology: Chang, Lowen etc. Various properties of Continuous functions, Open and Closed functions, Separation axioms in fuzzy topological spaces.
(ii) use Posets, Isomorphism, Lattices, Properties of Lattice, distributive lattices, Infinite Distributivity, Complete Lattice, product of lattices.

(iii) analyze *L*- fuzzy sets and *L*-topology, Compactness, Connectedness, Separation axioms, Metrization theorems in *L*- fuzzy topological spaces, Product Spaces, *L*-fuzzy Uniform Spaces.

   c   **Fuzzy Mathematics**

Fuzzy Mathematics

Course Outcome

Upon completion of this course, students will be able to

    (i)   understand the basic idea of fuzzy set theory.
    (ii) utilization of fuzzy set theory in practical life.
    (iii) get idea of fuzzy relation.
    (iv) understand the basic idea of fuzzy Topology.

   d **Graph Theory**

Graph Theory

Course Outcome

Upon completion of this course, students will be able to

    (i) Get the basic idea of intersection graph, degree sequence, concepts of factorization, 1-factorization, 2-factorization and arboricity. Also, able to know about covering and independence along with their properties.
    (ii) Know about basic of Matching theory. Utilize the knowledge of Matching on Berge's theorem, König's theorem for maximum matching, Hall's theorem, closed neighbourhood. The concept of domination is also able to learn.
    (iii) Planar graph and related topics are able to learn. Coloring concept is one of the important   concepts of graph theory and it is known to the research scholar from this. Learn to   solve bounds for chromatic number. Get the preliminary idea of the four colour theorem and   the five colour conjecture, uniquely colourable graph, Critical graph, Chromatic polynomial,   Brooks' theorem, Vizing's theorem,
    (iv) The concept of matrix representation of graph is able to understand along with the properties. Digraph and the properties of digraph is understandable to research scholar.
    (v) Get Generalization of Graph: Hypergraph & Semigraph, Dual of hypergraph, Cycles in hypergraph, conformal hypergraphs, Representative graph of a hypergraph, matching in hypergraph, degrees in semigraph, Subsemigraph and partial subsemigraph, s-Path, s-cycle, Edge bipartite semigraph, Dendroids.

   e **Functional Analysis**

Functional Analysis

Course Outcome

Upon completion of this course, students will be able to

    (i) explain spectral theory and itsproperties,properties of resolvent, self-adjoint linear operators and positive operators, fundamental properties of Banach Algebras, C* Algebras.
    (ii) use the spectral properties of compact linear operators on normed spaces and operator equations involving compact linear operators
    (iii) analyse spectral properties on self-adjoint linear operators, projection operator continuous function etc.
    (iv) corelate functional analysis to problems arising in different branches of mathematics.
    (v) use all the concepts of functional analysis for higher study such as research, project etc.

f   Methods of Demographic Analysis

Methods of Demographic Analysis

Course Outcome

Upon completion of this course, students will be able to

(i) present the basic demographic concepts and theories of population growth.
(ii) present sources of demographic information, the elements for demographic analysis and principal determinants of population change.
(iii) to explore the demographic features, trends and population problems of the area in particular and that of the state, nation and the world in general.

Paper-V: Research and Publication Ethics

Research and Publication Ethics

Course Outcome

Upon completion of this course, students will be able to

(i) explain philosophy and ethics
(ii) know Scientific conduct & publication ethics
(iii) utilize open access publishing
(iv) analyze dadabases and research metrics.

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