VIKRAM UNIVERSITY, UJJAIN (M.P.)

According to Ph.D. Ordinance no. 11

COURSE WORK

(Syllabus)

Ph.D. (MATHEMATICS)

SESSION- 2018-2019

VIKRAM UNIVERSITY, UJJAIN (M.P.)

As per Ph.D. Ordinance No. 11
COURSE WORK-SYLLABUS
Ph.D. (MATHEMATICS)
Session: 2018-2019

Scheme of Papers/ Examination

Paper	Title of Papers	Credits	Marks
Paper I : MATC 01	Research Methodology	4	100 (60+40 CCE)
Paper II : MATC 02	Review of Published Research in the relevant field	3	100 (60 written report+ 40 oral presentation)
Paper III : MATC 03	Computer Applications	3	100 (60+40 CCE)
Paper IV : MATC 04	Advance Course in Mathematics	3	100 (60+40 CCE)
Paper V : MATC 05	Comprehensive Viva-Voce	3	100
Total		16	**500**

Notes :

1. The candidate has to obtain a minimum of 55% of marks or its equivalent grade points in aggregate in the course work in order to be eligible to continue in the Ph.D. programme.

2. If a student obtains F or Ab Grade in a course/ subject, he/ she will be treated to have failed in that course. He/ she have to reappear in the examinations in the next semester.

3. If he/she further fails in the course, he/she shall not be given another chance and he/she shall be out of the Ph.D. programme.

Paper I : MATC 01: Research Methodology

Unit 1: Research Methodology: An Introduction (1.1 to 1.10), Defining the Research Problem (2.1 to 2.4), Research Design (3.1 to 3.4), Testing of Hypothesis (10.0 to 10.15), Interpretation and Report Writing (19.1to 19.10).

Unit 2: Literature survey, Internet as a medium for research, Knowledge of web search, Elements of an article: Title, Abstract, Keyword, Introduction, Formulation, Result and discussion, References, Evaluation of research: plagiarism, citation, impact factor etc. Review of research papers, Working knowledge of Google Scholar, Research Gate, Web of Science, MathSciNet, SCOPUS and/or other open-source/subscribed journals and books.
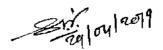
UNIT 3: Simulation- What is Simulation, Types of Simulation, Why to use Simulation, Limitations of Simulation Techniques, Phases of Simulation model, Generations of Random Numbers, Monte-Carlo Simulation, Simulation and its applications.

UNIT 4: Inventory, Types of Inventory model, Inventory Decision, Cost involving in Inventory Problems, Variables in Inventory problems, Concept of EOQ, The EOQ model with shortage.

UNIT 5: Replacement and Reliability models, Failure mechanisms of items, Replacement of items that deteriorate, Replacement Policy for items whose maintenance cost increase with time and money value is constant, Money value, Present work factor and discount rate.

Recommended Books:
1. Kothari, C.R. and Garg, G.: Research Methodology: Methods and Techniques, 3rd Edition, New age International publishers (2014).
2. Panneerselvam, R., Research Methodology, Prentice Hall Of India, New Delhi, 2004.
3. S. D. Sharma, Operations Research, Kedarnath Ramnath and Company.
4. Kanti Swarup, P K Gupta and Manmohan, Operations Research, Sultan Chand & Sons, Delhi.
5. D. S. Heera and P K Gupta, Operations Research and Introduction, Sultan Chand & Sons, Delhi.
6. H. A. Taha, Operations Research- An Introduction, Macmillan Publishing Co.

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Course Work

Ph.D. (MATHEMATICS)

Paper II : MATC 02   Credit-03

Max. Marks 100

(60 written report+ 40 oral presentation)

- **Review of Published Research in the relevant field**

Credit-03
Max. Marks 100(60+40 CCE)

Paper III : MATC 03: Computer Applications

Unit 1: Introduction to Computer fundamental, Characteristics of Computers, Evolution of computers, computer memory, computer generations, Basic computer organization; System software, Application software, introduction to operating system, single user, multi-user, multi-tasking single tasking, application of computer for business and research, MS-windows.

Unit 2: MS-Office and its application, File handing in window, various versions of MS-Office, Research publishing tool- MS-Word, Adobe acrobat, Graphics tool- MS-Excel, MS-Power Point.

UNIT 3: History of C Language, Identifiers in C, Variables and DataTypes, Constants, Printf and Scanf, Control Flow - Conditional Branching, the Switch Statement. looping. nested loops, The Break and Continue statement . the goto statement infinite loops.

Operators and Expressions: Precedence and associatively. Unary plus and Minus operators. Binary Arithmetic operators arithmetic assignment operators. Increment and decrement operators. Comma Operator, Relational operators, logical operators, bit- Manipulation operators, Bitwise assignment operators. Cast operators size of Operators , Conditional Operators, Memory Operators.

UNIT 4: Introduction:- Latex and open office, Writing of simple article, letters and applications, Mathematical symbols and commands, arrays, formulas and equations, Spacing, Borders and Colors,Creating different templets, Writing of research article, repots etc. Preparation of templets of thesis and books.Preparation of ppt. poster, etc., Pictures and Graphics.

UNIT 5: MATLAB: Basic introduction: Arithmetic operations, functions. plotting the graphs of different functions, Matrix operations, finding roots of an equation, Finding roots of a system of equations, Solving differential equations. Basic 2-D plots and 3-D plots.

Recommended Books:

1. Balaguruswami, E.: Programming in C, Tata Mcgraw Hill. (2012)

2. Peter A Darnell and Philip E. Margolis, C; A Software Engineering Approched narosa Publishing House (Springer International Student Edition) 1993.

3. Pratap, R.: Getting started with MATLAB, Oxford University Press, 2010.

4. Lynch,S.: Dynamical Systems with Applications using MATLAB, Birkhäuser, 2014.

5. Lamport, L.W.: LaTeX: A document Preparation Systems, Addison-Wesley Publishing Company, 1994.

6. Kopka, H., Daly, P.W.: Guide to LATEX, Fourth Edition, Addison Wesley, 2004

Ph.D. (MATHEMATICS)

Credit-03
Max. Marks 100(60+40 CCE)

Paper IV : MATC 04: Advance Course in Mathematics

Unit-I Ordinary Differential Equations, Numerical Method, Single Step Method, Multi-Step Methods, Predictor-Corrector Methods, Stability Analysis, Boundary Value Problems, Initial Value Methods, Finite Difference Methods.

Unit-II Improvement of the Initial Solution by Using Method of Bisection, Regula Falsi and Newton- Raphson Method of Fixed Point Iterative Schemes. System of Linear Algebraic Equation and Eigen Value Problem and Errors.

Unit-III Theory of Automata, Discription of a Finite Automaton, Transition System, Properties of Transition Function, Acceptability of a String by a Finite Autamaton, Non Deterministic Finite State Machines.

Unit-IV Markov Analysis Introduction, Stochastic (Random) Process, Markov Process, Transition Probability, Transition Probability Matrix, First Order and Higher Order Markov Process, N-Step Transition Probabilities, Markov Chain, Steady State (Equilibrium) Condition, Markov Analysis (Illustrative Example).

Decision Theory: Introduction, Type of Decisions, Component of Decision Making, Decision Models, Types of Environment, The Expected Monetary Value (EMV), Steps for Calculating EMV, The Expected Value of Perfect Information (EVPI), The Expected Opportunity Loss(EOL), Decision Making Under Uncertainty, Decision Making Under Conflict, Decision Tree Analysis, Deciosion Making Under Utilities: Utility Function, Utility Curve, Construction of Utility Curve. Posterior Probabilities and Bayesian Analysis.

Unit-V Sensitivity Analysis Introduction, An Important Lemma, Changes in the Coefficients 'Cj' of the Objective Function, Illustrative Example, Change in the Component 'bi' of Vector b, Change in the Component 'aij' of Matrix A, Change in the Structure of LPP: Addition of New Variable, Deletion of Existing Variable, Addition of New Constraint, Deletion of Existing Constraint.

Recommended Books:

1. Kanti Swarup, Gupta, P.K. and Manmohan: Operations Research, Sultan Chand & Sons, New Delhi, India.

2. Sharma, S.D. (2003): Operations Research, Kedarnath Ram Nath & Co. Fourteen edition, Meerut, Indian

3. M. K. Jain, RRK Iyenger. R. K. Jain: Numerical Metheods for Scientific and Enginnearing Computation, New Age International (P) Ltd.

4. K L P Mishra, N, Chandrashekharan: Theory of Computer Science, PHI-EEE.

5. V Rajaraman, Computer Oriented Numerical Methods, Printice Hall of India Pvt. Ltd, Delhi.

6. D. S. Heera and P K Gupta, Operations Research and Introduction, Sultan Chand & Sons, Delhi.

7. H. A. Taha, Operations Research- An Introduction, Macmillan Publishing Co.

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Credit 03

Max. Marks: 100

Paper V: MATC 05

- **Comprehensive Viva Voce**