## RANI DURGAVATI UNIVERSITY, JABALPUR

SYLLABUS OF M.A./M.Sc. MATHEMATICS SEMESTER SYSTEM SEMESTER – IV (Session 2017-18 and onwards)

Syllabus opted by the board of studies in Mathematics, R. D. University in the meeting held on 30-04-2016.

Choose any **five Papers** from the list of twelve papers.

| **Name of the Papers (Choose any five)** | **Theory (MM)** | **Min. Pass. Mark** | **C. C. E** | **Min. Pass. Mark** | **Practical M .M.** | **Min. Pass mark** | **Total** |
|---|---|---|---|---|---|---|---|
| **Paper I** : Abstract Harmonic Analysis | 35 | 12 | 15 | 05 | -- | -- | 50 |
| **Paper II:** Algebraic Topology | 35 | 12 | 15 | 05 | -- | -- | 50 |
| **Paper III**: Approximation by Trigonometric and Algebraic Polynomials | 35 | 12 | 15 | 05 | -- | -- | 50 |
| **Paper IV**: Fuzzy Sets and their Applications - II | 35 | 12 | 15 | 05 | -- | -- | 50 |
| **Paper V**: Infinite Matrices and Divergent Series | 35 | 12 | 15 | 05 | -- | -- | 50 |
| **Paper VI**: Spline Theory | 35 | 12 | 15 | 05 | -- | -- | 50 |
| **Paper VII** : Integration Theory | 35 | 12 | 15 | 05 | -- | -- | 50 |
| **Paper VIII**: Operations Research | 35 | 12 | 15 | 05 | -- | -- | 50 |
| **Paper IX**: Programming in C (Theory and Practical) –II | 25 | 09 | 10 | 04 | 15 | 06 | 50 |
| **Paper X**: Sobolev Spaces | 35 | 12 | 15 | 05 | -- | -- | 50 |
| **Paper XI**: Theory of Linear Operators | 35 | 12 | 15 | 05 | -- | -- | 50 |
| **Paper XII:** Wavelets Analysis | 35 | 12 | 15 | 05 | -- | -- | 50 |
| **Job- Oriented Project Work & Attendance (Compulsory )** | | | | | | | 50 =40+10 |
| **Comprehensive Viva-Voce (Compulsory )** | | | | | | | 50 |
| **Grand Total** | | | | | | | **350** |

**Note:**

- **In attendance 10 marks is allocated as per ordinance No. 79 of R.D. University Jabalpur.**
- **The students, whose attendance is less as per ordinance No. 79 of R.D. University Jabalpur, will not allow to appear in the examination at the close of semester and he/she would be declared having failed in that semester.**
- **In project 40 marks is allocated. Out of 40 marks, 15 marks is allocated for project file, 15 marks is allocated for presentation of their project work and 10 marks is allocated for project Viva-Voce examination.**
- **At the end of IV semester a Project Viva-Voce is to be conducted by a board of at least three examiner which includes at least on external examiner.**
- **At the end of IV semester a Comprehensive Viva-Voce is to be conducted by a board of at least three examiner which includes at least one external examiner.**

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**M.A./M.Sc. (Mathematics) Fourth Semester**
**Paper VII: Integration Theory**

Max. Marks: 35
Min. Pass. Marks: 12

Unit 1 General measures Examples, Semifinite and σ finite measures, Completion of a measure, Measurable functions.

Unit 2 Signed measures, Hahn Decomposition Theorem, Mutually Singular Measures Jordon Decomposition theorem.

Unit 3 Radon - Nikodym Theorem, Lebesgue Decomposition Theorem, Caratheodary Extension Theorem.

Unit 4- Baire sets, Baire measures, Regularity of measures on locally compact spaces, Product measures, Fubini's theorem.

Unit 5 Integration of continuous functions with compact support on locally compact spaces, Riesz - Makov theorem.

Recommended Books:

1- H.L. Royden Real Analysis, macmillan publishing co. Inc. Newyork, 4th Edition, 1993.

Referance Books:

1- P.R, Halmos, Measure theory, Van Nostrand

2- I.K. Rana, Introduction to measure and integration, Narosa Publishing House, New Delhi.

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**M.A./M.Sc. (Mathematics) Fourth Semester**
**Paper VIII: Operations Research**

Max. Marks: 35
Min. Pass. Marks: 12

**Unit I** Operations Research and its scope. Origin and Development of Operations Research, Characteristics of Operations Research, Model in Operations Research, Phase of Operations Research, Uses and Limitations of Operations Research, Linear Programming Problems, Mathematical Formulation, Graphical Solution Method.

**Unit II** Inventory theory : Inventory models on economic lot size system with uniform and non uniform demand, Economic leet size with finite rate of replenishment, A simple order level system with constant rate of demand with shortage, Generalized economic leet size model, Multi items deterministic models, Probabilistic model, Instantaneous demand, no setup cost model, Uniform demand, no setup cost model

**Unit III** Waiting lines, distribution theorem, classification of queueng model: models: (M/M/1):(∞/FCFS), (M/M/1)(N/FCFS). General Erlang queuing model, (M/M/S):(∞/FCFS), (M/M/S):(N/FCFS), (M/Ek/1):(∞/FCFS).

**Unit IV** Network analysis, constraints in Network, Construction of network, critical Path Method (CPM)PERT, PERT Calculation, Resource Leveling by Network Techniques and advances of network (PERT/CPM), Replacement problem: Replacement problem when money value does not change/changes with Time, Group replacement policy, Mortality theorem.

**Unit V** Game theory- Two persons, Zero-sum Games, Maximin - Minimax principle, games without saddle points- Mixed strategies, Graphical solution of 2xm and mx2 games, Solution by Linear Programming, Non-Linear programming Techniques-Kuhn-Tucker Conditions, Non-negative Constrains.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. S.D. Sharma, Operations Research.
2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995(This book comes with a CD containing software)

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**M.A./M.Sc. (Mathematics) Fourth Semester**
**Paper IX: Programming in C (Theory and Practical)**

Max. Marks: 25
Min. Pass. Marks: 09

Unit 1-

An overview of programming languages, Classification.
C Essentials – Programs development, Functions. Anatomy of a Function. Variables and Constants Expressions. Assignment Statements. Formatting Source files Continuation Character. the Preprocessor.

Unit 2-

Scalar Data types – Declarations, Different Types of integers. Different kinds of Integer Constants Floating – point type Initialization. mixing types Explicit conversions – casts.
Enumeration Types. the void data type , Typedefs. Pointers.

Unit 3-

Control Flow – Conditional Branching, the Switch Statement. looping. nested loops. the Break and Continue statement . the goto statement infinite loops.

Unit 4-

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 operator.

Unit 5-

Arrays and multidimensional Arrays. Storage Classes – fixed vs. Automatic Duration Scope, global variable The Register Specifier Structures and Unions.

Recommended Books:


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


Reference Books:


1 Samuel P. Harkison and Gly L Steele Jr. C; A Reference manual , 2an Edition Prentice hall 1984.
2 Brain W Kernigham & Dennis M Ritchie the C Programmed Language 2nd Edition (ANSI features), Prentice Hall 1989.


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## M.A./M.Sc. (Mathematics) Fourth Semester
## Paper XI: Theory of Linear operators

Max. Marks: 35
Min. Pass. Marks: 12

Unit 1-

Spectral theory in normed linear spaces, resolvent set and spectrum, Spectral properties of bounded linear operators. Properties of resolvent and spectrum. Spectral mapping theorem for polyonmials.

Unit 2-

Spectral radius of a bounded linear operator on a complex banach space. Elementary theory of Banach algebras. General properties if compact linear operators.

Unit 3-

Spectral properties of compact linear operators on normed spaces. Behaviours of Compact linear operators with respect to solvability of operators equation.

Unit 4-

Fredholm type theorems. fredholm alternative theorem. Fredhoml alternative for integral equation. spectral properties of bounded self – adjoint linear operator on complete Hilbert space..

Unit 5-

Positive operators Monotone sequence theorem for bounded self – adjoint operators on a complex Hilbert space. square roots of a positive operator. projection operators.

Recommended Books:


1 E. Kreyszig Introductory functional analysis with applications, Jhon wiley & Sons, Nwe York, 1978.


Referance Books:


1 P. R. Halmos Introduction to Hilbert space and the theory of Spectral Multiplicity, Second edition, Chelsea publishing co. N.Y. 1957.
2 N. Dundford and J.T. Schwartz, linear operator -3 part, Interscience / Wiley, New York 1958-71.
3 G.Bachman and L. Narci, Functuional analysis, Academic press New York, 1966.


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**M.A./M.Sc. (Mathematics) Fourth Semester**
**Paper XII: Wavelets Analysis**

Max. Marks: 35
Min. Pass. Marks: 12

**Unit I** Haar's simple wavelets, Haar Wavelet transforms, Inverse Haar Wavelet transforms, Multi Dimensional wavelets, Two - dimensional Haar Wavelets.

**Unit II** Application of wavelets, Noise reduction Data compression, Edge detection, Daubechies wavelet (DW), approximation of samples with D wavelets, Fast DW transform and its inverse.

**Unit III** Inner products and orthogonal projection, Applications of orthogonal projection to computer graphics, Computation of functions and wavelets, Discrete and fast Fourier transform with inverse and applications.

**Unit IV** Fourier series for periodic functions its convergence and inversion, uniform convergence of Fourier series, Bessel's inequality, Parseval's inequality.

**Unit V** The Fourier transform Convolution and inversion of Fourier transform Weight functions, Approximate identities.

**Text Books:-**

1- Wavelets made easy by Y. Nieveregelt
2- A first Course on Wavelets by E. Hernandez and G. Weiss.

**Reference Books:**

1- An Introduction to Wavelets by Chui, Academic Press.

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