Mathematics Paper-II
Numerical Analysis
[CORE COURSE]

Semester: III	Credits: 2	Subject Code: BS32104	Lectures: 36

Course Outcomes:

At the end of this course, the learner will be able to:

- Demonstrate understanding of common numerical methods and how these methods are used to obtain solutions of mathematical problems.
- Derive and apply numerical methods to obtain best approximations to the exact solutions of non-linear equations, Linear Systems, Interpolation problems, Integration problems and Ordinary Differential Equations.
- Analyze and evaluate the convergence and accuracy of different numerical methods and thus compare the methods.
- Equip with mathematical modelling abilities, problem solving skills, Selection of appropriate method etc.

Unit 1: Algebraic and Transcendental Equations	**8**
• Introduction to Errors • False Position Method • Newton Raphson Method ○ Convergence of Newton Raphson Method	

Unit 2: Calculus of Finite Differences and Interpolation	**12**
• Differences • Forward Differences • Backward Differences • Shift Operator, Inverse Shift Operator • Central Difference Operator and Average Difference Operator • Properties of Operators • Relation between Operators • Newton Gregory Formula for Forward Interpolation • Newton Gregory Formula for Backward Interpolation • Lagrange's Interpolation Formula • Divided Differences – Formula, Properties • Newton's Divided Difference Interpolation Formula	

Unit 3: Numerical Integration	**8**
• General Quadrature Formula • Trapezoidal Rule • Simpson's One–Third Rule	

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○ Maximization in Transportation Problems ○ Degeneracy in Transportation Problems • The Assignment Model (Hungarian Method) ○ Mathematical Model for Assignment Problem. ○ Special Cases in Assignment Problem - Unbalanced Assignment Problem, Maximization in Assignment Problem, Assignment Problem with restrictions, Travelling Salesman Problem	

Unit 5: Sequencing Problems	**6**
• Introduction • Definition of a Sequencing Problem • Processing n Jobs through Two Machines • Processing n Jobs through Three Machines • Processing two jobs through m Machines	

No. of Lectures = 36 + 12 (Contact Hours) = 48 (Total)

Recommended Textbooks:

- P.K. Gupta and D.S. Hira. *Operations Research*. S. Chand and Company Ltd., 1 January 2015
  Sections: Chp. 2, Chp. 3, 4.1 −4.3, Chp. 5, Chp. 6, Chp. 10, Chp. 11, 12.1−12.6
- S.D.Sharma, *Operation Research* (12th Edition) 1998
  Unit 1: Chapter 1: Sec. 1.1, 1.3-1, 1.3-2, 1.5, 1.6, 1.8, 1.9, 1.10, 1.11, 1.12,
  Chapter 3: Sec. 3.1, 3.2, 3.3, 3. 4, 3.5-4,
  Unit 2: Chapter 3: Sec. 3.8-1,3.8-2, Chapter 5: Sec. 5.1-1, 5.2-1,5.3,5.7-1, 5.7-2
  Unit 3: Chapter 9: Sec. 9.1, 9.2, 9.4-1, 9.4-2, 9.5, 9.6, 9.7-1, 9.7-2
  Unit 4: Chapter 10: 10.1, 10.2, 10.5, 10.8-1,10.9, 10.10

Reference Books:

- H. A. Taha, *Operations Research An Introduction*, Pearson Publication, 10th Edition 2017
- H. M. Wagner, Principles of Operations Research, Prentice Hall of India, 2004.
- J.K. Sharma, Operation Research, Laxmi Publications, 1 January 2017
- R. Panneerselvam, *Operations Research*, Prentice Hall of India, 2005

Websites:

- http://mathforcollege.com/nm/topics/textbook_index.html

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Chairman (HoD)	Gitanjali Phadnis	G.M.Phadnis 20/3/2021	
Faculty	Vrushali Paranjpe		20/3/2021
Subject Expert (Outside SPPU)	Dr. Machchhindra Gophane	20/3/21	
Subject Expert (Outside SPPU)	Dr. Prashant Malavadkar		20-03-2021
VC Nominee (SPPU)	Dr. Vinayak Joshi		
Industry Expert	Mr. Anup Manakeshwar		20/3/2021
Alumni	Ms. Jyoti Sharma	20/03/2021	

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