

Kadi Sarva Vishwavidhyalaya, Gandhinagar
BCA Semester II
BCA208 – Part 3: Foundation Course
Computer Oriented Numerical Techniques

Rationale:

Computer Oriented Numerical methods provides the understanding of various concepts of numerical methods like Numerical errors in calculations, Interpolation, Numerical Integration, Numerical solution of Ordinary Differential Equations.

Prerequisites:

1. Fundamental knowledge of Numerical Computations
2. Basic information of storage in computer system
3. Idea of equal-spaced values

Learning Outcomes:

Concept cause & consequence of errors in the application of numerical computing
 Numerical techniques for solving various problems
 Applications of mathematics in real life domain

Teaching and Evaluation Scheme:

Sub. Code	Sub. Type	Subject Title	Teaching Scheme		Exam Scheme				
			Cr.	Hrs. / Week	Theory		Practical		Total Marks
					Internal	External	Internal	External	
BCA 208	Foundation Course	Computer Oriented Numerical Techniques	2	2	15	35	-	-	50

Course content:

Unit 1: (50%)

Objective: To facilitate deep understanding of accuracy, precision and different numerical errors. To help learners to enhance their knowledge in the field of interpolation; To find out values of unknown information from given set of known information.

Numerical Errors and Interpolation

Numerical Error, Different types of errors in numerical computation (Absolute, Relative, Truncation, Round Off, Percentage), Floating point numbers, Normalized Floating Point (addition, subtraction, multiplication, division, underflow, overflow)

Interpolation, Extrapolation, Forward Differences, Backward Differences, Newton’s Forward and Backward Difference Interpolation Formulas, Lagrange Interpolation and Inverse Interpolation Formula (Examples Only).

Coverage of topics in Books:

Scientific and Statistical Computing Page no. 1-42, 108-113,126-137,164-167,184-187,
 Computer Oriented Numerical Methods (R.S.) Page no.36-53[50], 221-244[228-229,232-235]

Application: Main application is to obtain numerical solution of real life problems with considerable ease and to obtain approximate solution as close to the exact solution as possible. To enhance knowledge of storage of real numbers in computer system; Interpolation is widely used in functionality of Zoom in and Zoom out. To optimize quality of digital image

Unit-2: (50%)

Objective: To study basic concepts of integration and differentiation. To integrate part of function or given tabulated values. To enhance concept of ordinary differential equations. To study the behavior of the approximation error as a function of the number of integrand evaluations

Numerical Integration and Solution of Ordinary Differential Equations

Numerical Integration, Trapezoidal Rule, Simpson's (1/3) rule, Simpson's (3/8) rule, Weddle's Rule (Examples Only)

Concept of Numerical Differentiation and Ordinary Differential Equations (ODE), Euler's method, Modified Euler's method, RK 2nd order method, RK 4th order method (Examples Only)

Coverage of topics in Books:

Numerical Methods 9.17-9.20,9.24-9.27, 11.22-11.32[11.24],11.35-11.41

Computer Oriented Numerical Methods (R.S.) 301-307,310-313,317-319,332-333,
350-354,356-361,367-370

Applications: To find the area under the curve of a function. Integration can be used to find areas, volumes, central points and to parameterize a curve. To develop a large-scale integration (LSI) enabled hardware. To simulate information systems such as computer controlled systems, communication systems, and control systems.

Climate modeling, Big bang theory modeling, Prediction of building failures all the natural phenomenon (heat equations, fluid flow equations, hooks law etc) can be modeled using differential equations. ODE is used in signal processing and different signal transforms; also used to find maxima and minima of quantity and to build application which shows temperature. The heating and cooling problem of computer is modeled using the differential equation and solved by computer itself. Also used in Simulation based applications.

Text Book:

1. Scientific and Statistical Computing: Auther(s): Ketan Gajjar, Parag Shah Publication: Nirav Prakashan
2. Computer Oriented Numerical Methods: Auther(s): R. S. Salaria ,Publication: Khanna Book Publishing Co. Ltd.
3. Numerical Methods: Auther(s): Dr. V. N. Vedmurthy, Dr. Ch. S. N. Iyenger, Publication: Vikas Publishing House Pvt. Ltd.

Reference Books:

1. Introductory methods of Numerical Analysis [5th Ed.]: Auther(s): S.S. Sasrty, Publication: PHI Learning Pvt. Ltd.
2. Mathematics for Computer Students: Auther(s): Rex Wilton, Publication: BPB Publication,
3. Computer Oriented Numerical Methods: Auther(s): V. Rajaraman, Publication: Prentice Hall of India

Question Paper Pattern:

University Examination	Duration: 1.5 Hours	Total Marks: 35
Q-1 Unit I & II (n Out of n [All Compulsory]) Objective/Short Questions		(11 Marks)
Q-2 Unit I (m Out of n) Descriptive/ Long Questions		(12 Marks)
Q-3 Unit II (m Out of n) Descriptive/ Long Questions		(12 Marks)
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