Numerical Method

BEG370C0

Year: III Semester: I

<table>
<tr><td colspan="3">Teaching Schedule Hours/Week</td><td colspan="5">Examination Scheme</td></tr>
<tr><td rowspan="3">Theory</td><td rowspan="3">Tutorial</td><td rowspan="3">Practical</td><td colspan="2">Internal</td><td colspan="2">Final</td><td>Total</td></tr>
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<tr><td>80</td><td>-</td><td>20</td><td>50</td></tr>
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Course Objective:

To solve the engineering problems by using the theory of numerical Computational procedures

1. Introduction **4 Hours**

1.1. Numerical computing process
1.2. New trends in Numerical Computing
1.3. Application in Numerical Computing
1.4. Taxonomy of errors in numerical method
1.5. Absolute Relative & percentage errors

2. Solution of non – Linear equation **7 hours**

2.1. Iterative methods and stopping criteria
2.2. Bisection method & its Convergence
2.3. Horner's method
2.4. Newton- Raphson method and its convergence
2.5. Secant method and its convergence
2.6. Evaluation of polynomials using Horner's Rule

3. Curve Fitting **8 Hours**

3.1 Interpolation
- 3.1.1 Linear interpolation
- 3.1.2 Lagrange interpolation
- 3.1.3 Newton interpolation
- 3.1.4 Newton Divided Different interpolation
- 3.1.5 Spine interpolation: cubic spines
- 3.1.6 Control Interpolation (Gauss Forward/ Backward Formulae)

3.2. Regression
- 3.2.1 Least squares Regression
- 3.2.2 Fitting Transcendental Equations.
- 3.2.3 Fitting a polynomial function

4. Numerical Different & integration **7 Hours**

4.1 Differentiating continuous functio
  4.1.1 Forward Difference Quotient
  4.1.2 Backward Difference Quotient
  4.1.3 Central Difference quotient
4.2 Newton cotes methods of integration
  4.2.1 Trapezoidal rule and composite trapezoidal rule
  4.2.2 Simpson's 1/3 rule & its composite
  4.2.3 Simpson's 3/8 rule.
  4.2.4 Boole 's Rule

4.3 Romberg integration
4.4 Gaussian integration

5. Linear Algebraic Equations **10 Hours**

5.1 Elimination Approach
  5.1.1 Basic Gauss Elimination
  5.1.2 Gauss Elimination with partial pivoting
  5.1.3 Gauss Jordon method
  5.1.4 LU decomposition methods
    5.1.4.1 Do Little Algorithm
    5.1.4.2 Crout Algorithm
  5.1.5 Matrix Inversion Method
  5.1.6 Cholesky Method

5.2 Iterative method
  5.2.1 Iconic method
  5.2.2 Gauss- seidal method
  5.2.3 Eigen values and eigen vectors using power method & inverse power method

6. Solution of ordinary differential equations **6 Hours**

6.1 Euler's method .
6.2 Heun's method (predictor – Corrector method)
6.3 Fourth order Runge-kutta method
6.4 Systems of differential equations using Heun's method
6.5 Higher order differential equations using Heun's method

7. Solutions of partial differential equations **3 Hours**

7.1 Elliptic equations
  7.1.1 Poisson's equations
  7.1.2 Laplace's equations
7.2 Parabolic Equations
7.3 Hyperbolic Equations

Laboratories

1. Review of properties of programming language
2. Bisection method
3. Newton-raphson method
4. Secant method & Horner's rule
5. Lagrange interpolation
6. Linear Regression
7. Basic gauss elimination method
8. Gauss seidal method
9. Matrix inversion method
10. Trapezoidal rule
11. Simpson's 1/3 rule
12. Simpson's 3/8 rule
13. Solution of differential equation using Euler's method
14. Solution of differential equation using Runge-Kutta method

Final exam question format (80 marks)	3 hours
Group A attempt any six questions (out of 7)	6*10=60
Group B attempt any two questions (out of 3)	2*10=20

(Algorithm & programs)

References

1. E. Balagurusamy " Numencal Methods ' Tatal Mc Graw Hill
2. S.Yakwitz and F. szidarouszky '' An Introduction to Numerical Computations "2nd Edition Macmillan Publishing co ', New York .
3. W. Cdhency and D kixaid " Numerical Mathematics 4 computing "2nd Editior, Brooks /Cole publishing
4. C.F Gerald and P.o. Wheatley " Applied Numerical Analysis "4th Editim Addipon wesley publishing co. New york .
5. W. It presss, B p. Flannery et . al "Numerical Recises Inc", 1st Edition, Cambridge press 1988