BANGALORE UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, UVCE, BENGALURU
B.Tech. PROGRAMME IN COMPUTER SCIENCE AND ENGINEERING

<table>
<tr><td>Course Code</td><td colspan="6">18BSEM401</td></tr>
<tr><td>Category</td><td colspan="6">Basic Sciences</td></tr>
<tr><td>Course title</td><td colspan="6">Engineering Mathematics-IV</td></tr>
<tr><td rowspan="3">Scheme and Credits</td><td colspan="5">No. of Hours/Week</td><td rowspan="3">Semester - IV CSE/ISE</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>SS</td><td>Credits</td></tr>
<tr><td>2</td><td>2</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>CIE Marks: 50</td><td colspan="2">SEE Marks: 50</td><td colspan="3">Total Max. Marks: 100</td><td>Duration of SEE: 03 Hours</td></tr>
<tr><td colspan="7">Prerequisites (if any): NIL</td></tr>
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COURSE OBJECTIVES:

This course will enable all students to

1. To understand range of analytic functions and concerned results.
2. Understand and find Taylor series and determine their intervals of convergence.
3. Solve an algebraic or transcendental equation using an appropriate numerical method.
4. Solve boundary value problems using the finite difference method.
5. Being aware of exact, approximate and numerical methods to solve the resulting equations.

UNIT I: **09 Hours**

Sets in a complex plane - Functions of a complex variables. Limit, Continuity and differentiability (definitions only). Analytic function - Riemann equations in Cartesian and polar forms. Harmonic functions, Constructions of analytic functions (Cartesian and polar forms). Line integral - Cauchy's theorem-corollaries. Cauchy's integral formula for complex function and for derivatives, Conformal transformations: $1/z$, z^2, e^z and $z + \frac{a^2}{z}$ $(z \neq 0)$. Bilinear transformations.

UNIT II: **09 Hours**

Power series, convergence, radius of convergence, Taylor's and Laurent's theorems (Statements only) Singularities. Poles Calculation of residues. Residue theorem (without proof)–problems. Evaluation of Contour integrals.

UNIT III: **10 Hours**

Numerical solution of algebraic and transcendental equations-solution by Bisection, Ramanujan method, linear iteration and Newton-Raphson methods. Solution of linear simultaneous equations: Gauss elimination method, Gauss Jordan method, Gauss Seidel methods, LU decomposition method, methods of Crout, Doolittle and Cholesky.

UNIT IV: **10 Hours**

Finite differences (Forward and backward differences), Interpolation, Newtons forward and backward interpolation formulae, Central difference formulae: stirlings and Bessels formula. Interpolation with unequal spaced points: Lagarange interpolation formula, and inverse interpolation formulae. Divided differences and their properties: Newtons general interpolation

formula. Interpolation by iteration, Numerical differentiation using Newtons forward and backward interpolation formulae, Numerical integration: Trapezoidal method, Simpson 1/3 rule Simpons3/8th rule.

UNIT V: **10 Hours**

Numerical solution of ordinary differential equations: Solution by Taylor's series, Picard's method of successive approximation, modified Euler's method, Runge Kutta methods of second and fourth order, Predictor and corrector methods – Adams – Bashforth method, Adams-Moultons method.

TEXT BOOKS:

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna publishers, 42nd edition, 2013.
2. E. Kreyszig, "Advanced Engineering Mathematics" - Wiley, 2013.

REFERENCE BOOKS:

1. B.V. Ramana "Higher Engineering Mathematics" Tata Mc Graw-Hill, 2006
2. N P Bali and M. Goyal, "A text book of Engineering mathematics", Laxmi publications, latest edition.
3. H. K Dass and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand publishing, 1st edition, 2011.
4. S. S. Sastry, Introductory methods of Numerical Analysis, 3rd edition, Prentice-Hall India.
5. M. K. Jain, S. R. K. Iyengar, R. K. Jain, Numerical methods for scientific and Engineering computation, New Age international Publishers.

COURSE OUTCOMES:

The students at the end of the course, will be able to

CO1: Understanding necessary and sufficient condition for analytic function and Cauchy' integral formula.

CO2: Express the length of a curve as a (Riemann) sum of linear segments, convert to definite integral form and compute its value.

CO3: Approximate a function using an appropriate numerical method.

CO4: Solve boundary value problems using the finite difference method.

CO5: Being aware of exact, approximate and numerical methods to solve the resulting equations.

SCHEME OF EXAMINATION:

<table>
<tr><td rowspan="2">CIE – 50 Marks</td><td>Test I (Any Three Units) - 20 Marks</td><td>Quiz I – 5 Marks</td><td>25 Marks</td><td rowspan="2">Total: 50 Marks</td></tr>
<tr><td>Test II (Remaining Two Units) - 20 Marks</td><td>Quiz II – 5 Marks</td><td>25 Marks</td></tr>
<tr><td rowspan="3">SEE – 100 Marks</td><td colspan="2">Q1 (Compulsory): MCQs or Short answer type questions for 15 Marks covering entire syllabus.</td><td>15 Marks</td><td rowspan="3">Total: 100 Marks</td></tr>
<tr><td colspan="2">Q2 & Q3 from Units which have 09 Hours are compulsory.</td><td>17 * 2 = 34 Marks</td></tr>
<tr><td colspan="2">Q4 or Q5, Q6 or Q7 and Q8 or Q9 from Units which have 10 Hours shall have Internal Choice.</td><td>17 * 3 = 51 Marks</td></tr>
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Note: SEE shall be conducted for 100 Marks and the Marks obtained is scaled down to 50 Marks.

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