Course Plan for Spring Semester 2019

Tezpur University
Course: MS 105, Mathematics-II
(For the B. Tech. Students of the School of Engineering)
L3-T1-P0-CH4-CR4

Name of the instructors:
1. Dr. Rajat Kanti Nath, Dept. of Mathematical Sciences
2. Ms. Nilufar Mana Begum, Dept. of Mathematical Sciences
3. Mr. Deepak Sarma, Dept. of Mathematical Sciences
4. Mr. Ajay Sharma, Dept. of Mathematical Sciences
5. Mr. Parama Dutta, Dept. of Mathematical Sciences

Abstract: The course introduces basics of linear algebra, complex analysis, numerical analysis and integral transforms. This course gives a thorough understanding of the theory and its applications. Emphasis is given to developing problem solving capability.

Course Objective:
1. To learn the basics of linear algebra, complex analysis, numerical analysis and integral transforms.
2. To enable the students for developing their computational skills.

Prerequisites of the course: None

Course Outline + Suggested readings:

Unit 1: Linear algebra (12 lectures)

Unit 2: Complex analysis (6 lectures)
Limit, continuity, differentiability and analyticity of functions Cauchy-Riemann equations, elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

Unit 3: Complex integration (8 lectures)
Line integrals, contour integral, Cauchy’s integral theorem, Cauchy’s integral formula, Cauchy Integral formula (without proof), Liouville’s theorem and Maximum-Modulus theorem (without proof). Taylor’s series, zeros of analytic functions, singularities, Laurent’s series; Residues, Cauchy Residue theorem (without proof).

Unit 4: Numerical methods-I (7 lectures)
Finite differences, relation between operators, Interpolation using Newton’s forward and backward difference formulae. Interpolation with unequal intervals: Newton’s divided difference and Lagrange’s formulae.
Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson Method, Secant method and Regula-Falsi method.

**Unit 5: Numerical methods-II (6 lectures)**


**Unit 6: Integral transform (6 lectures)**


**Textbook(s)**

**Reference book(s)**

**Pedagogy:**
Lecture method, Quiz, Home assignment, Discussion etc.

**Lecture Plan for the Course:**

<table>
<thead>
<tr>
<th>Lecture No.</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rank of a matrix</td>
</tr>
<tr>
<td>2</td>
<td>Linear system of equations</td>
</tr>
<tr>
<td>3</td>
<td>Gauss eliminations and Gauss-Jordan eliminations</td>
</tr>
<tr>
<td>4</td>
<td>LU-factorization</td>
</tr>
<tr>
<td>5</td>
<td>Vector Spaces and examples</td>
</tr>
<tr>
<td>6</td>
<td>Linear dependence of vectors</td>
</tr>
<tr>
<td>7</td>
<td>Basis</td>
</tr>
<tr>
<td>8</td>
<td>Linear transformation</td>
</tr>
<tr>
<td>9</td>
<td>Range and Kernel of a linear map</td>
</tr>
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<td>10</td>
<td>Rank and nullity</td>
</tr>
<tr>
<td>11</td>
<td>Matrix associated with a linear map</td>
</tr>
<tr>
<td>12</td>
<td>Eigen values and Eigen vectors</td>
</tr>
<tr>
<td>13</td>
<td>Finite difference operators and their relations</td>
</tr>
<tr>
<td>14</td>
<td>Newton’s forward interpolation formula</td>
</tr>
</tbody>
</table>
15 Newton's backward interpolation formula
16 Interpolation with unequal intervals - Newton's divided difference formula
17 Interpolation with unequal intervals - Lagrange's interpolation formula
18 Bisection and Newton-Raphson method
19 Secant and Regula-falsi method

20 Taylor's series
21 Numerical differentiation
22 Numerical differentiation contd.
23 Numerical integration
24 Numerical solution of ODE
25 Numerical solution of ODE contd.

26 Functions of complex variables
27 Limit & continuity
28 Differentiability & analyticity
29 Cauchy-Riemann equations
30 Exponential, trigonometric & logarithmic functions
31 Exponential, trigonometric & logarithmic functions contd.

32 Line Integrals and contour integrals
33 Cauchy's Integral Theorem & Formula
34 Integration continues
35 Taylor's series
36 Laurent's series
37 Zeros and singularities
38 Residue theorem
39 Residue theorem contd.

40 Laplace transform
41 Laplace transform contd.
42 Evaluation of integrals by Laplace transform
43 Solution of ODE and PDE by Laplace transform
44 Fourier transform
45 Fourier transform contd.

Evaluation plan:
TEST I  : 25 Marks
MAJOR I : 40 Marks
TEST III : 25 Marks
MAJOR II : 60 Marks
TOTAL   : 150 Marks

Expected outcome of the course: Towards the end of the course the student would be able to apply the concepts taught in various problems in Engineering.