**Course-34 Title: Mathematics-IV**

**Course Code: MAT 221 Credit: 3.00 Contact Hour: 3 per week Total marks: 100**

**11.1 Rationale:**

One has to be achieved knowledge about Complex Variable, Laplace Transformation, Fourier series and Fourier Transformation for being a computer Engineer.

**11.2 Objectives:**

1. To achieve knowledge about Complex Variables.
2. To know and apply theLaplace Transformation, Fourier series and Fourier Transformation.

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| **11.3**  **Learning Outcomes** | **11.4**  **Course Content** | **11.5**  **Teaching / Learning Strategy** | **11.6 Assessment Strategy** |
| 1. ***Define complex number,*** Limits and continuity of functions of a complex variable. | | **Complex Variable:**  Complex number system. General functions of a complex variable. Limits and continuity of functions of a complex variable and related theorems | Lecture  Exercise | Assignment  Essay  Exercise  Short answer | |
| 1. Derive Cauchy- Riemann Equation. | | Complex differentiation and the Cauchy-Riemann equations. Mapping by elementary functions. | Lecture  Exercise | Assignment  Essay  Exercise  Short answer | |
| 1. State and prove Cauchy's integral theorem, 2. Cauchy's integral formula, 3. Liouville's theorem | | Line integral of a complex function. Cauchy's integral theorem. Cauchy's integral formula, Liouville's theorem. Taylor's and Laurent's theorems. | Lecture  Exercise | Assignment  Essay  Exercise  Short answer | |
| 1. Singular points. Residue, 2. Cauchy's residue theorem. 3. Evaluate residues, contour integration, conformal mapping | | Singular points. Residue, Cauchy's residue theorem. Evaluating of residues, contour integration, conformal mapping | Lecture  Exercise | Assignment  Essay  Exercise  Short answer | |
| **Explain** Laplace transformation  List some properties of Laplace transformation  Solve differential equations by Laplace transformation | | **Laplace Transform :**  Definition, Laplace transformation of some elementary functions. Sufficient conditions for existence of Laplace transforms. Inverse Laplace transforms of derivatives. The unit step function. Periodic Function's. Some special theorems on Laplace transforms. Partial fraction. Solutions of differential equations by Laplace transforms. Evaluation of improper integrals. | Lecture  Exercise | Assignment  Essay  Exercise  Short answer | |
| Describe Fourier Series, fourier Coefficients and half range Fourier series  Derive Fourier sine and cosine series for various problems  Explain Fourier sine and cosine transform  Deduce Fourier sine and cosine transform for various problems  State and prove Convolution theorm  Establish the relation betweenFourier transforms and Laplace Transform | | **Fourier Series:**  Definition, Fourier Co-efficient, half-range Fourier Series, Fourier series in different intervals.  Fourier Series, convergence of Fourier Series, Fourier Analysis, Fourier integral. Z- Transformation and its application. Application of Laplace Transforms and Fourier series in Circuits.  **Fourier Transform:**  The finite fourier sin and cosine transform. Inverse finite Fourier sin and cosine transform.Fourier Transform, Inverse Fourier transform. Fourier sin and cosine transform. Inverse Fourier sin and cosine transform, Relation between Fourier transforms and Laplace Transform Convolution Theorem. | Lecture  Exercise | Assignment  Essay  Exercise  Short answer | |

**RECOMMENDED BOOKS AND PERIODICALS**

**References:**

1. E. T. Capson : An Introduction to the theory of Function of a Complex Variable.

2. V. Churchill : Complex Variable.

3. Charchill : Fourier Series and Boundary Value Problems.

4. M.R. Spiegel : Laplace Transform.

5. Goyal and Gupta : Functions of Complex variable