Semester III			
Core IX - Transforms with MATLAB			
Code: 17PCCC31	**Hrs/Week: 4**	**Hrs/Sem: 60**	**Credits : 3**

Objectives

1. To enable students develop their calculation skills using MATLAB.
2. To apply various techniques in solving problems.

Unit I

Fourier Transforms:Introduction - Fourier Integral theorem - Fourier Transforms - Alternative form of Fourier complex integral formula - Relationship between Fourier Transforms and Laplace Transforms.

(Text Book 1 - Chapter 2 : Sections 2.1 , 2.2 , 2.3 , 2.4 , 2.5)

Unit II

Properties of Fourier Transforms - Finite Fourier Transforms .

(Text Book 1 - Chapter 2 : Sections 2.6 , 2.7)

Unit III

Z - Transforms: Introduction - Properties of Z- Transforms - Z-Transforms of some basic functions - Inverse Z- Transforms - Use of Z-Transforms to solve finite differential equations.

(Text Book 1 - Chapter 5 : Section 5.1 , 5.2 , 5.3 , 5.4 , 5.5)

(Exercise Problems are not included)

Unit IV

MATLAB Introduction: MATLAB Environment - Types of files - Search - Constants , Variables and Expressions - Vectors and Matrices - Polynomials - Input / Output statements.

(Text Book 2 - Chapter 1, 2, 3, 4, 5)

Unit V

Control Structures - Writing Programmes and functions - Ordinary Differential Equations and Symbolic Mathematics - MATLAB Applications : Z-Transforms and Fourier Transforms.

(Text Book 2 - Chapter 7, 8, 9, 15 (Sections: 15.1, 15.6, 15.7,15.8)

Text Books:

1. T.Veerarajan : Transforms and Partial Differential Equations (Updated Edition), 2012.
2. Rajkumar Bansal , Ashok Kumar Goel , Manoj Kumar Sharma : MATLAB and its Applications in Engineering, Pearsons Publications, 2012.

Semester III			
Core IX - Practical - Transforms with MATLAB			
Code: 17PCCCR1	**Hrs/Week: 2**	**Hrs/Sem: 30**	**Credits : 1**

Using MATLAB:

1. Find the Fourier sine transforms of f(x) defined as f(x) = $\begin{cases} sinx \text{ , } when\ 0 < x < a \\ 0 \text{ , } when\ \ x > a \end{cases}$

2. Find the Fourier cosine transform of f(x) defined as f(x) = $\begin{cases} x & for\ 0 < x < 1 \\ 2 - x & for\ 1 < x < 2 \\ 0 & for\ x > 2 \end{cases}$

3. Find the Fourier transform of f(x) if f(x) = $\begin{cases} 1 - |x| & for\ \ |x| < 1 \\ 0 & for\ |x|\ > 1 \end{cases}$. Hence prove that $\int_0^\infty \frac{sin^4 x\, dx}{x^4} = \frac{\pi}{3}$

4. Solve the equation ($D^2 -$ 4D + 3) y = cos 3x , x > 0 given that y(0) =0 and y'(0) = 0.

5. Find the finite Fourier sine transform of cos ax and finite Fourier cosine transform of sin ax in (0 , π).

6. Find the finite Fourier sine transform and cosine transform of e^{ax} in (0 , *l*).

7. Find the Z-Transforms of f(n) = $\frac{1}{n(n-1)}$

8. Use convolution theorem to find the inverse Z-Transforms of $\frac{z^2}{(z+a)^2}$

9. Find $Z^{-1}\{ \frac{1}{1+4Z^{-2}} \}$by the long division method.

10. Find $Z^{-1}\{\frac{2z^2+4z}{(z-2)^3}\}$ by using Residue theorem.

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Semester III			
Elective III–Calculus of Variations and Integral Equations			
Code: 17PMAE31	**Hrs/Week: 6**	**Hrs/Sem: 90**	**Credits : 3**

Objectives:

- To solve differential equations using variational methods.
- To introduce Fredhlom&Volterra Integral equations and to study the methods of solving the above equations.

Unit I:

The Calculus of Variations - Functionals - Euler's equations - Geodesics - Variational problems involving several unknown functions.

(Chapter 9: Sections 1 - 11)

Unit II:

Functionals dependent on higher order derivatives - Variational problems involving several independent variables - Constraints and Lagrange multipliers.

(Chapter 9: Sections 12 - 14)

Unit III:

Isoperimetric problems - The general variation of a functional - Variational problems with moving boundaries - Hamilton's principle, Sturm - Liouville's problems and variational methods - Rayleigh's principle - Ritz method.

(Chapter 9: Sections 15 - 21)

Unit IV:

Integral Equations - Introduction - Relation between differential and integral equations - Relationship between Linear differential equations and Volterra integral equations.

(Chapter 10: Sections 1 - 3)

Unit V:

The Green's function and its use in reducing boundary value problems to integral equations - Fredholm equations with separable kernels - Fredholm equations with symmetric kernels: Hilbert Schmidt theory - Iterative methods for the solution of integral equations of the second kind - The Neumann series - orthogonal kernels.

(Chapter 10: Sections 5 - 11)

Text Book:

Dr.M.K.Venkataraman, Higher Mathematics for Engineering and Sciences, The National Publishing Company, 2001.

Book for Reference:

Francis B. Hildebrand, Methods of Applied Mathematics, second edition, Prentice-Hall of India private limited, 1968.

Semester IV			
Elective IV– Projective Geometry			
Code: 17PMAE41	**Hrs/Week :6**	**Hrs/Sem: 90**	**Credits : 4**

Objectives

- To acquire the essential ideas and methods of differential Geometry.
- To learn about the classical theory of curves, surfaces and vector methods.

UNIT-I

Projective Geometry as an extension of high school geometry: Two approaches to projective geometry-An initial question-Projective invariants-Vanishing points – Vanishing lines-Some projective noninvariants – Betweenness-Division of a segment in a ratio-Desargues' Theorem-Perspectivity;projectivity-Harmonic tetrads;fourth harmonic-Further theorems on harmonic tetrads. **(Chapter 1 : Sections 1-12)**

UNIT-II

Projective Geometry as an extension of high school geometry: The cross-ratio-Fundamental Theorem of Projective Geometry-Further remarks on the cross- ratio-Construction of the projective plane- Previous results in the constructed plane-Analytic construction of the projective plane.**(Chapter 1 : Sections 13-18)**

UNIT-III

The axiomatic foundation: Unproved propositions and undefined terms-Requirements on the axioms and undefined terms-Undefined terms and axioms for a projective plane-Initial development of the system;the Principle of Duality-Consistency of the axioms-Other models-Independenceof the axioms-Isomorphism-Further axioms-Consequences of Desargues' Theorem-Free planes. **(Chapter 2 : Sections 1-11)**

UNIT-IV

Establishing coordinates in a plane : Definitions of a field-Consistency of the field axioms-The analytic model –Geometric description of the operations plus and times- Setting up coordinates in the projective plane-The non commutative case. **(Chapter 3 : Sections 1-6)**