M.E Semester: 1 Mechanical Engineering (Thermal Engineering)
Subject Name: APPLIED MATHEMATICS

A. **Teaching Scheme Course Objective**

- To present a problem oriented in depth knowledge of Applied Mathematics For Thermal Engineering
- To address the underlying concepts and methods behind Applied Mathematics For Thermal Engineering

B. **Teaching / Examination Scheme**

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
METH106-D	Applied Mathematics	3	0	0	3	3	3	70	30	20	0	120

C. **Detailed Syllabus**

1. FOURIER TRANSFORMS: Fourier Transforms, Complex, Sine and Cosine Transforms, Finite Fourier Transforms. Applications – One dimensional heat conduction problem, Laplace Equation, Poison Equation.
2. CALCULUS OF VARIATIONS: Variation and its properties – Euler's equation – Functionals dependent on first and higher order derivatives – Functionals dependent on functions of several independent variables – Some applications – Direct methods – Ritz and Kantorovich methods.
3. CONFORMAL MAPPING AND APPLICATIONS: The Schwarz – Christoffel transformation – Transformation of boundaries in parametric form – Physical applications – Application to fluid flow – Application to heat flow.
4. SOLUTIONS OF LINEAR SYSTEMS OF EQUATIONS: Matrix transformations – Direct methods – Gaussian Elimination method, Gauss Jordan method, Factorisation method. Iterative methods – Jacobi, Gauss Seidel and SOR methods.
5. NUMERICAL SOLUTION OF PDE: Solution of Laplace's and Poission equation on a rectangular region by Liebmann's method – Diffusion equation by the explicit and Crank Nicholson – Implicit methods – Stability and Convergence criterion – Solution of wave equation by explicit scheme.

D. **Lesson Planning**

Sr.No.	Date/Week	Unit No.	% Weightage	Topic No:
1	1^{st} ,2^{ed} ,3^{ed}	Unit 1	20 % .	1
2	4^{th} ,5^{th} ,6^{th}	Unit 2	20 %	2
3	7^{th} ,8^{th} ,9^{th}	Unit 3	20 %	3
4	19^{th} ,11^{th} ,12^{th}	Unit 4	20 %	4
5	13^{th} ,14^{th} ,15^{th}	Unit 5	20 %	5

E. **Instructional Method & Pedagogy**

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

F. **Students Learning Outcomes**

- The student can identify different areas of Applied Mathematics For Thermal Engineering.
- Can find the applications of all the areas in day to day life.

G. **Recommended Study Materials**

- **Text & Reference Books**

1. Sneddon,I.N., “Elements of partial differential equations”, McGraw-Hill ,1986.
2. Spiegel, M.R., “Theory and problems of complex variables with an introduction toconformal mapping and its applications”, Schaum’s outline series, McGraw-Hill BookCo., 1987.
3. SankaraRao, K., “Introduction to partial differential equations”, Prentice–Hall of India,1995.
4. Elsgolts, L., “Differential equation and calculus of variations”, Mir Publishers, 1996.
5. Carnanan. B., Luther. H.A., and Wilkes, J.O., “Applied Numerical Methods”, Wiley andSons, 1976.