NATIONAL INSTITUTE OF TECHNOLOGY: TIRUCHIRAPPALLI- 620 015

DEPARTMENT OF MATHEMATICS

COURSE OUTLINE TEMPLATE			
Course Title	MA 613: Engineering Mathematics		
Course Code	MA 613	No. of Credits	3
Department	Mathematics	Course: M. Tech Branch: Industrial Metallurgy	
Pre-requisites Course Code	B. Tech, Engineering Mathematics		
Course Coordinator(s) (if, applicable)	Dr. K. Murugesan		
Other Course Teacher(s)/Tutor(s)		Email Id	Telephone No.
Dr. K. Murugesan		murugu@nitt.edu	9486001132 3661,3668
Course Type	√ Core course	☐ Elective course	

COURSE OVERVIEW

To understand the mathematical applications to engineering problems using PDE, Calculas of variations, Numerical methods and Finite element methods.

COURSE OBJECTIVES

- To make the students mathematically strong for solving engineering and scientific problems.
- To train students with mathematical aspects so as to comprehended, analyse, design and create novel products and solution for the real life problems.

COURSE OUTCOMES (CO)	
Course Outcomes	**Aligned Programme Outcomes (PO)**
1. Understand the fundamentals and applications of Fourier series, Calculus of variation method and PDE's to solve engineering problems. 2. To identify, formulate and solve metallurgical engineering problems in terms of Mathematical concepts. 3. To have knowledge about PDE's and how they serve as mathematical models for the physical processes such as vibrations and heat transfer problems. 4. To be familiar with the mathematical ability to design and conduct experiments, interpret and analyze data and generating correlation of obtained results.	The engineering post graduates will apply their knowledge of mathematics to engineering problems.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week	Topic	Mode of Delivery
	Week- 1	1. Basic concepts PDE 2. One dimensional heat flow equations and its solutions 3. Solve some more problems + Tutorials	Chalk and Talk
	Week - 2	4. Two dimensional heat flow equations 5. Solve some more problems 6. Polar and Cartesian forms 7. Solve some more problems + Tutorials	

	Week-3 Week - 4	1. Basic concepts of calculus of variations 2. Euler's equation 3. Euler's equation in function of several variables 4. Functionals involving higher order derivatives + Tutorials 5. Variational problems in parametric form 6. Natural boundary condition 7. Conditional Extremum 8. Isoperimetric problems + Tutorials	Chalk and Talk
	Week -5 Week - 6	1. Numerical Solution of ODE's 2. Taylor's method 3. Euler's, methods 4. Improved & Modified Euler method + Tutorials 5. Runge Kutta methods 6. Runge - Kutta method for simultaneous differential equations 7. Milne's predictor-corrector methods 8. Adams' predictor-corrector methods + Tutorial	Chalk and Talk
	Week – 7 Week - 8	1. Classification of PDE's 2. Finite difference scheme method 3. Elliptic equations – Laplace equation in 2D 4. Elliptic equations – Poisson's equation + Tutorials 5. Parabolic equations (one dimensional heat equation) 6. Bender Schmidt method 7. Crank-Nicholson method 8. Hyperbolic equations – two dimensional wave equation + Tutorials	Chalk and Talk

	Week -9 Week -10	1. Introduction to Finite Element Method 2. Rules for forming interpolation functions 3. Shape functions + Tutorials 4. Application to fluid flow 5. Application to heat transfer problems + Tutorials	Chalk and Talk

COURSE ASSESSMENT METHODS

S.No.		Week/Date	Duration	% Weightage
1.	Cycle Test –I	4th week	1 Hour	20%
2.	Cycle Test-II	8th week	1 Hour	20%
3.	Retest	9th week	1 Hour	
4.	Assignments (Two)			10%
5.	End Semester Exam		3 Hour	50% Total : 100 Marks

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

Reference Books

1. Grewal, B.S., Higher Engineering Mathematics, 42ndedition, Khanna Publications, Delhi, 2012.
2. Venkataraman, M.K, Higher Engineering mathematics, National Publishing Co. 2003.

FOR SENATE'S CONSIDERATION

Course Faculty _____ CC-Chairperson _____ HOD _____

8/09/2016