

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: Material Science & Engg	
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	<input checked="" type="checkbox"/> Core course	<input type="checkbox"/> Elective course	
COURSE OVERVIEW			
<p>To understand the mathematical applications to engineering problems using PDE, Calculus of variations, Numerical methods and Finite element methods.</p>			
COURSE OBJECTIVES			
<ul style="list-style-type: none"> • To make the students mathematically strong for solving engineering and scientific problems. • To train students with mathematical aspects so as to comprehend, analyse, design and create novel products and solution for the real life problems. 			

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
<ol style="list-style-type: none">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	<ol style="list-style-type: none">1. Basic concepts PDE2. One dimensional heat flow equations and its solutions3. Solve some more problems + Tutorials	Chalk and Talk
	Week - 2	<ol style="list-style-type: none">4. Two dimensional heat flow equations5. Solve some more problems6. Polar and Cartesian forms7. Solve some more problems + Tutorials	
	Week-3	<ol style="list-style-type: none">1. Basic concepts of calculus of variations2. Euler's equation3. Euler's equation in function of several variables4. Functionals involving higher order derivatives + Tutorials	Chalk and Talk

	Week - 4	<ol style="list-style-type: none"> 5. Variational problems in parametric form 6. Natural boundary condition 7. Conditional Extremum 8. Isoperimetric problems + Tutorials 	
	Week -5	<ol style="list-style-type: none"> 1. Numerical Solution of ODE's 2. Taylor's method 3. Euler's, methods 4. Improved & Modified Euler method + Tutorials 	Chalk and Talk
	Week - 6	<ol style="list-style-type: none"> 5. Runge Kutta methods 6. Runge - Kutta method for simultaneous differential equations 7. Milne's predictor-corrector methods 8. Adams' predictor-corrector methods + Tutorial 	
	Week - 7	<ol style="list-style-type: none"> 1. Classification of PDE's 2. Finite difference scheme method 3. Elliptic equations – Laplace equation in 2D 4. Elliptic equations – Poisson's equation + Tutorials 	Chalk and Talk
	Week - 8	<ol style="list-style-type: none"> 5. Parabolic equations (one dimensional heat equation) 6. Bender Schmidt method 7. Crank-Nicholson method 8. Hyperbolic equations – two dimensional wave equation + Tutorials 	
	Week -9	<ol style="list-style-type: none"> 1. Introduction to Finite Element Method 2. Rules for forming interpolation functions 3. Shape functions + Tutorials 4. Application to fluid flow 	Chalk and Talk

	Week -10	5. Application to heat transfer problems + Tutorials	
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COURSE ASSESSMENT METHODS

S.No.		Week/Date	Duration	% Weightage	
1.	Cycle Test -I	4 th week	1 Hour	20%	
2.	Cycle Test-II	8 th week	1 Hour	20%	
3.	Retest	9 th week	1 Hour		
4.	Assignments (Two)			10%	
5.	End Semester Exam	After 12 weeks NRG	3 Hour	50%	Total : 100 Marks

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

Reference Books

1. Grewal, B.S., Higher Engineering Mathematics, 42nd edition, Khanna Publications, Delhi, 2012.
2. Venkataraman, M.K, Higher Engineering mathematics, National Publishing Co. 2003.
3. Desai, C.S, & Abel, J.P, Introduction to Finite Element Method, Van Nostrand Reinhold.
4. Reddy, J.N, Introduction to Finite Element Method, McGraw-Hill.

ADDITIONAL COURSE INFORMATION

eg.: The Course Coordinator is available for consultation at times that are displayed on the coordinator's office notice board. Queries may also be emailed to the Course Coordinator directly at -----

FOR SENATE'S CONSIDERATION

Course Faculty *[Signature]*
8/9/2016

CC-Chairperson *N Ramesh Babu*
8/9/16 HOD *S. Murali*
8/9/2016