NATIONAL INSTITUTE OF TECHNOLOGY: TIRUCHIRAPPALLI- 620 015

DEPARTMENT OF MATHEMATICS

COURSE OUTLINE			
Course Title	Engineering Mathematics		
Course Code	MA 613	**No. of Credits**	3
Department	Mathematics	**Programme :** M. Tech **Branch** : Industrial Metallurgy	
Pre-requisites Course Code	NIL		
Course Coordinator(s) (if, applicable)	Dr. K. Murugesan		
Course Teacher		**Email Id**	**Telephone No.**
Dr. V. Balakumar		balav@nitt.edu	
Course Type	Core 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 comprehend, analyse, design and create novel products and solutions for the real life problems.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. To have knowledge about PDE's and how they serve as mathematical models for the physical processes such as vibrations and heat transfer problems. 2. Understand the fundamentals and applications of Fourier series, Calculus of variation method and PDE's to solve engineering problems. 3. To identify, formulate and solve metallurgical engineering problems using numerical methods. 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 method 4. Improved & Modified Euler method + Tutorials 5. Runge Kutta methods 6. Runge - Kutta method for simultaneous differential equations	Chalk and Talk

		7. Milne's predictor-corrector methods 8. Adams' predictor-corrector methods + Tutorial	
	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.
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.

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

1. Students can meet the faculty at any stage in the course duration in case he/she finds difficulty in understanding the concepts.
2. Student knowledge about the topic covered in this course will be judged through marks obtained in examination.

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

1. Examination:
   a) Students who have missed the Cycle Test – 1 or Cycle Test - 2 or both can register the **Re-Test** which shall be conducted soon after the completion of the Cycle Test – 2 and before the regular semester examination.

b) The Re-Test examination shall be conducted for 20 marks comprising the syllabus of both Cycle Test – 1 and Cycle Test - 2.
c) Students should submit assignments before last date of submission. In case students fail to submit their assignments, he/she will get zero mark for that particular assignment.
d) Students are strictly not allowed to enroll for Re-Test to improve their marks.

2. Attendance:
   a) The minimum attendance for appearing for the semester examination is 75%.
   b) Those students, whose attendance falls below 75% but above and equal to 50% in a subject, shall attend mandatory classes before the semester examinations to qualify to write semester exam.
   c) The students who are having attendance less than 50% or have not attended mandatory classes has to redo the course in next semester.

ADDITIONAL COURSE INFORMATION

Students can reach course faculty by fixing appointment through E-mail (balav@nitt.edu).

FOR SENATE'S CONSIDERATION

Course Faculty V. Balakumar . **CC-Chairperson** _____ **HOD** _____ 24/8/2017

(Dr. V. BALAKUMAR)

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