M.Tech Mat Scien

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI - 620 015

DEPARTMENT OF MATHEMATICS

COURSE PLAN			
Course Title	ENGINEERING MATHEMATICS		
Course Code	MA613	No. of Credits	3
Session	July-2018	M. Tech Material Science Engineering	
Pre-requisites Course Code	B.Tech. Mathematics (MAIR11, MAIR21, MAIR32, MAIR41)		
Name of Faculty	Dr. K. Murugesan, Department of Mathematics		
Course Teacher/E-mail	murugu@nitt.edu	Mobile No.	9443785050
Course Type	General Institute Requirements(Core course)		

COURSE OVERVIEW

- This course will introduce the
  (1) Basic Concepts in Partial Diferrential Equations,One dimentional/two dimentional Heat conduction equations and its applications.
  (2) Fourier series solutions. Euler formulas in calculas of variations
  (3) Numerical solutions for ODE's and PDE's
  (4) Application of fluif flow problems

COURSE OBJECTIVES

Objective of the course is to introduce

1. Finding solution for one/two dimensional heat equations and its Fourier series solutions.
2. To find the maxima and minima of functions of one/two/several variables.
3. To find the numerical solution of ODE's and PDE's
4. To find the rules for forming the interpolation functions and shape functions.
5. To find the application of fluid flow and heat transfer problems.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes(PO)
1. On completing this course student will be able to understand and apply the methodologies to solve the ordinary differential equations(ODEs) and PDE's using known numerical methods.	This M.Tech students will apply their knowledge in solving engineering problems

2. Understanding the Applications of Partial Differential Equations – Solution of one/two - dimensional heat flow equations – using the method of separation of variables. 3. To be familiar with calculus of variations and Euler's equations and solve variational problems. 4. Understand the finite difference scheme and solve the PDE's 5. Familiarize the finite element method to solve the heat transfer problems.	This engineering M. Tech-graduates will apply their knowledge of Partial Differential Equations and numerical methods to solve the problems arising in the industry.

MA613 – ENGINEERING MATHEMATCIS

Partial Differential equations – Basic concepts – One dimensional heat flow equation - Two dimensional heat flow equation in steady flow in Cartesian and Polar coordinates.

Calculus of variations - Euler's equation - Variational problems in parametric form - Natural boundary condition – Conditional Extremum - Isoperimetric problems.

Numerical Solution of ODE's – Euler's, Taylor's and Runge Kutta methods – Milne's and Adams' predictor-corrector methods.

Finite difference scheme for elliptic, parabolic, and hyperbolic partial differential equations. Introduction to Finite Element Method - Rules for forming interpolation functions - Shape functions - Application to fluid flow and heat transfer problems.

TEXT BOOKS

1..Desai, C.S. and Abel, J. P., Introduction to Finite Element Method;
Van Nostrand Reinhold Co., 1991.
2. Elsegolts, L., Differential Equations and the Calculus of Variations, Mir Publishers, 1977.
3. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 2017.
4. Reddy, J.N., Introduction to Finite Element Method, Mcgraw Hill, 2016
5. Veerarajan,T. Numerical Methods, Volume III, Tata Mcgraw Hill Edition, New Delhi, 2009.

COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	**Week**	**Topic**	**Mode of Delivery**
1.	Week- 1	Introduction to basic concepts for PDE's, One dimensional heat equations and its applications	Chalk and Talk
	Week- 2	Solution of one dimensional heat equation using method of separation of variables.	
2.	Week- 3	Two dimensional heat equations and its applications	
3.	Week- 4	Solution of two dimensional heat equation using method of separation of variables.	
4.	Week- 5	Two dimensional heat flow equation in steady flow in Cartesian coordinates.	Chalk and Talk
5.	Week- 6	Solution of two dimensional heat equation using method of separation of variables in polar form.	
6.	Week- 7	Two dimensional heat flow equation in steady flow in Polar coordinates.	
7. /	Week- 8	Calculus of variations - Euler's equation - Variational problems in parametric form –	
8.	Week- 9	Natural boundary condition – Conditional Extremum - Isoperimetric problems	
9.	Week- 10	Numerical Solution of ODE's – Euler's, Taylor's and Runge Kutta methods – Milne's and Adam's	
10.		predictor-corrector methods.	Chalk and Talk
11.	Week- 11	Finite difference scheme for elliptic, parabolic, and hyperbolic partial differential equations.	
12.	Week- 12	Introduction to Finite Element Method - Rules for forming interpolation functions – Shape functions	
13.	Week- 13	Application to fluid flow problems	
14.	Week- 14	Application of heat transfer problems.	Chalk and Talk
COURSE ASSESSMENT METHODS			

S.No.	Plan	Week/Date	Duration	% Weightage
1.	Assessment – I	7th week	1 Hour	20%
2.	Assessment - II	13th week	1 Hour	20%
3.	Assessment - III	14th week	1 Hour	20%
4.	Two Seminar (OR) Assignments (each covering two units with five marks weightage)			10%
5.	Final Assesment	15th or 16th week	3 Hours	50% Total : 100 Marks

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed.)

1. Feedback from students during class committee meeting.
2. Anonymous feedback through questionnaire (as followed previously by the Institute).

COURSE POLICY (Preferred mode of correspondence with students, Policy on attendance, Compensation assessment, academic honesty and plagiarism, etc.)

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1. Examination:
   a) Students who have missed the first or second Assessment test or both can register for Assessment - III examination which shall be conducted soon after the completion of the second Assesment test and before the regular semester examination.

   b) The Assessment - III examination shall be conducted for 20 marks comprising the syllabus of both first and second Assesment tests.

   c) Students should submit the assignments before the last date of submission. In case students fail to submit their assignments; he/she will get zero mark for that particular assignment.

2. Attendance:
   a) The minimum attendance for appearing the final assessment is 75%.

   b) Minimum of 10% shall be allowed On Duty(OD) category.

   c) The students who are having less than 65% attendance will be prevented from writing the final assessment and be awarded 'V' grade.

1. Students who have failed in the final assessment with 'F' grade and those who have missed the final assessment with valid medical/genuine reason shall take the Re-assessment.

2. Students awarded 'V' grade must compulsorily redo the course.

3. Passing minimum should be 40%.

ADDITIONAL COURSE INFORMATION

Faculty is available for discussion after the class hours in the Department of Mathematics. (Room No. 207). Students can fix the appointments by sending an e-mail to murugu@nitt.edu and can come for discussion in the afternoon 3:30 P.M. - 5:30 P.M.

FOR APPROVAL

Course Faculty Dr.K.Murugesan for CC-Chairperson _____ HOD _____