DEPARTMENT OF MATHEMATICS
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	M.Tech. / Power Electronics		
Course Title	Advanced Engineering Mathematics		
Course Code	MA603	No. of Credits	3
Course Code of Pre-requisite subject(s)	NIL		
Session	July 2022	Section (if, applicable)	-
Name of Faculty	Sahaya Jenifer A (Mentor: P. Saikrishnan)	Department	Mathematics
Email	sahayajenifer496@gmail.com	Telephone No.	8248930410
Name of Course Coordinator(s) (if, applicable)	-		
E-mail	-	Telephone No.	-
Course Type	✓ Core course	☐ Elective course	

Syllabus (approved in BoS)

Introduction to Linear Programming Techniques - Unconstrained one dimensional optimization techniques - Necessary and sufficient conditions - Unrestricted search methods - Fibonacci and Golden section method.

Unconstrained n dimensional optimization techniques – Descent methods - Steepest descent, conjugate gradient. Constrained optimization Techniques - Necessary and sufficient conditions - Equality and inequality constraints - Kuhn-Tucker conditions - Gradient projection method.

Numerical Solution of Ordinary Differential Equations - Euler's method - Euler's modified method - Taylor's method and Runge-Kutta method for simultaneous equations and 2nd order equations - Multistep methods - Milne's and Adams' methods.

Random variable – Two dimensional random variables – standard probability distributions – Binomial, Poisson and normal distributions - moment generating function.

Sampling distributions - confidence interval estimation of population parameters - testing of hypotheses - Large sample tests for mean and proportion - t-test, F-test and Chi-square test - curve fitting - method of least squares.

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

1. Rao,S.S., 'Optimization :Theory and Application', Wiley Eastern Press, 2nd edition 1984.

2. Taha, H.A.,'Operations Research – An Introduction', Prentice Hall of India,2003.

3. Jain, M.K., Iyengar, S.R., and Jain, R.K., 'Numerical Methods for Scientific and Engineering Computation', Wiley Eastern, 1992.

4. Bowker and Liberman, Engineering Statistics, Prentice - Hall, 1972.

5. S. C. Gupta, Fundamentals of Statistics, Himalaya Publishing House, Seventh Revised Edition, 2009.

6. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, Eleventh Revised Edition, 2014.

COURSE OBJECTIVES

1. To study essential optimization techniques to solve linear programming problems and unconstrained one dimensional optimization problems.
2. To learn Kuhn-Tucker conditions for constrained optimization problems and methods to solve multidimensional optimization problems.
3. To discuss the numerical methods to solve the ordinary differential equations.
4. To introduce random variables and find moment generating function of standard probability distributions.
5. To discuss the concepts of Sampling Distribution and Testing of hypotheses.

Mapping of course outcomes (COs) with programme outcomes (POs)

Course Outcomes	Aligned Programme Outcomes (PO)
On completion of this course students will be able to: 1. Solve linear programming problems and unconstrained one dimensional optimization problems. 2. Use Kuhn-Tucker conditions to solve constrained optimization problems and apply Steepest Descent and Conjugate methods to solve multidimensional optimization problems. 3. Solve ordinary differential equations numerically using Euler's, Taylor's and Runge-Kutta methods. 4. Find moment generating function of Binomial, Poisson and Normal distributions. 5. Apply t-test, F-test and Chi-square test to analyze population means.	1,5 and 7

COURSE OVERVIEW

1. Introduce linear programming problems and unconstrained one dimensional optimization problems and study Fibonacci and Golden section methods to solve the problems.
2. Study Kuhn-Tucker conditions for constrained optimization problems and Steepest Descent and Conjugate methods to solve multidimensional optimization problem.
3. Discuss Euler's, Taylor's and Runge-Kutta numerical methods to solve ordinary differential equations.
4. Explain Random variable and finding moment generating function of Binomial, Poisson and Normal Distributions.
5. Learn statistical methods related to sampling distributions and testing of hypotheses.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	1st ,2nd & 3rd week	Numerical Solution of Ordinary Differential Equations - Euler's method - Euler's modified method - Taylor's method and Runge-Kutta method for simultaneous equations and 2nd order equations - Multistep methods - Milne's and Adams' methods.	Chalk and Talk
2.	4th , 5th & 6th week	Introduction to Linear Programming Techniques - Unconstrained one dimensional optimization techniques - Necessary and sufficient conditions - Unrestricted search methods - Fibonacci and Golden section method.	Chalk and Talk
3.	7th Week	**Assessment - 1**	
4.	7th, 8th & 9th week	Unconstrained n dimensional optimization techniques – Descent methods - Steepest descent, conjugate gradient. Constrained optimization Techniques - Necessary and sufficient conditions - Equality and inequality constraints - Kuhn-Tucker conditions - Gradient projection method.	Chalk and Talk
5.	10th ,11th &12th week	Random variable – Two dimensional random variables – standard probability distributions – Binomial, Poisson and normal distributions - moment generating function.	Chalk and Talk
6.	12th Week	**Assessment - 2**	

7.	13th, 14th & 15th Week	Sampling distributions - confidence interval estimation of population parameters - testing of hypotheses - Large sample tests for mean and proportion - t-test, F-test and Chi-square test - curve fitting - method of least squares.	Chalk and Talk
8.	15th week	**Compensation Assessment**	
9.	After 15th Week	**End-Semester Exam**	

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week / Date	Duration	% Weightage
1.	Assessment- 1 (written exam)	7th Week	1 hour	20%
2.	Assessment -2 (written exam)	12th Week	1 hour	20%
3.	Assessment-3 (Assignments)	Every 3 weeks	1 week	10%
CPA	Compensation Assessment	15th Week	1 hour	20%
4.	Final Assessment (Written Exam)	After 15th Week	3 hours	50%

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

1. Feedback from the students during class committee meetings and in the class after the assessments 1 and 2.

2. Online feedback through questionnaire before the final assessment.

3. Student knowledge about the topics covered in this course will be judged through marks obtained in examination.

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email / phone etc)

Students can meet the course faculty for clarifying doubts by fixing appointment through E-mail (sahayajenifer496@gmail.com) or mobile (8248930410)

COMPENSATION ASSESSMENT POLICY

a) Students who have missed either Assessment-1 or Assessment-2 or both can register for Compensation Assessment which shall be conducted soon after the completion of the Assessment-2 and before the final assessment.

b) The Compensation Assessment shall be conducted for 20 marks comprising the syllabus of both Assessment -1 & Assessment - 2.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

➤ **At least 75% attendance in each course is mandatory.**

➤ **A maximum of 10% shall be allowed under On Duty (OD) category.**

➤ Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

ACADEMIC DISHONESTY & PLAGIARISM

➤ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.

➤ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.

➤ The departmental disciplinary committee including the course faculty member, PAC chairperson and the HOD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

FOR APPROVAL

A. Sahaya Jenifer.		
Course Faculty	CC-Chairperson	HOD
(P - SAIKRISHNAN)		