



DEPARTMENT OF MATHEMATICS

COURSE PLAN – PART I			
Name of the programme and specialization	M.Sc. / MATHEMATICS		
Course Title	ORDINARY DIFFERENTIAL EQUATIONS		
Course Code	MA707	No. of Credits	3L+OT=3
Course Code of Pre-requisite subject(s)	NIL		
Session	August 2023	Section (if applicable)	
Name of Faculty	DR. V. SHANTHI	Department	MATHEMATICS
Official Email	vshanthi@nitt.edu	Telephone No.	9487440341
Name of Course Coordinator(s) (if, applicable)			
Official E-mail		Telephone No.	
Course Type (please tick appropriately)	<input checked="" type="checkbox"/> Core course	<input type="checkbox"/> Elective course	

Syllabus (approved in BOS)

The general solution of the homogeneous equation – The method of variation of parameters – Power Series solutions- Higher order linear equation-operator methods for finding particular solutions.

Series solutions of first-order equations – Second order linear equations; Ordinary points. Regular Singular Points – Gauss’s hypergeometric equation – The Point at infinity - Legendre Polynomials – Bessel functions – Properties of Legendre Polynomials and Bessel functions.

Linear Systems of First Order Equations – Homogeneous Equations with Constant Coefficients – The Existence and Uniqueness of Solutions of Initial Value Problem for First Order Ordinary Differential Equations – The Method of Solutions of Successive Approximations and Picard’s Theorem.

Oscillation Theory and Boundary value problems – Qualitative Properties of Solutions – Sturm Comparison Theorems – Eigenvalues, Eigen functions and the Vibrating String.

Nonlinear equations: Autonomous Systems; the phase plane and its phenomena – Types of critical points; Stability – critical points and stability for linear systems – Stability by Liapunov’s direct method – Simple critical points of nonlinear systems.

Text Books



NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

1. E.A. Coddington, An Introduction to Ordinary Differential Equations, Courier Corporation, 2012
2. G.F. Simmons, Differential Equations with Applications and Historical Notes, CRC Press, 2016
3. M.E. Taylor, Introduction to Differential Equations, AMS Indian Edition, 2011.
4. William E. Boyce, Richard C. DiPrima, Douglas B. Meade, Elementary Differential Equations and Boundary Value Problems, Wiley, 2017.
5. Lawrence Perko, Differential Equations and Dynamical Systems, Springer Science & Business Media, 2013

COURSE OBJECTIVES

The Course objective is to

1. Various approach to find general solution of the ordinary differential equations.
2. Theorems to discuss the existence of solutions of IVP for ODE
3. Special functions and its properties

MAPPING OF COs with POs

Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)
1. find the solutions of first and some higher order ordinary differential equations	a- e
2. discuss the existence and uniqueness of solutions of first and second order ODE	
3. apply properties of special functions in discussion the solution of ODE.	
4. model some physical problem and give physical interpretation of the solution.	

COURSE PLAN – PART II

COURSE OVERVIEW

This course will introduce

1. Various approach to find general solution of the ordinary differential equations.
2. Theorems to discuss the existence of solutions of IVP for ODE
3. Special functions and its properties

COURSE TEACHING AND LEARNING ACTIVITIES

(Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1 st to 3 rd week	The general solution of the homogeneous equation –The method of variation of parameters – Power Series solutions- Higher order linear equation- operator methods for finding particular solutions.	Chalk and talk



2	3 rd to 8 th week	<p>Series solutions of first-order equations – Second-order linear equations; Ordinary points. Regular Singular Points – Gauss's hypergeometric equation – The Point at infinity - Legendre Polynomials – Bessel functions – Properties of Legendre Polynomials and Bessel functions.</p> <p>Assessment 1</p>	<p>Chalk and talk</p> <p>Assignments</p>
3	8 th week	Assessment 2	1 hour test
4	9 th 11 th weeks	<p>Linear Systems of First Order Equations – Homogeneous Equations with Constant Coefficients – The Existence and Uniqueness of Solutions of Initial Value Problem for First-Order Ordinary Differential Equations – The Method of Solutions of Successive Approximations and Picard's Theorem.</p>	Chalk and talk
5	11 th -14 th week	<p>Oscillation Theory and Boundary Value problems – Qualitative Properties of Solutions – Sturm Comparison Theorems – Eigenvalues, eigenfunctions and the Vibrating String.</p> <p>Assessment 3</p>	<p>Chalk and talk</p> <p>Assignments</p>
6	14 th week	Assessment 4	1. hour test
7	14 th – 16 th week	<p>Nonlinear equations: Autonomous Systems; the phase plane and its phenomena – Types of critical points; Stability – critical points and stability for linear systems – Stability by Lyapunov Direct method – Simple critical points of nonlinear systems</p>	Chalk and talk



NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

	Final Assessment	3 hours exam
--	------------------	--------------

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment 1	2-7 th week		5%
2	Assessment 2	8 th week	1 hr	20%
3	Assessment 3	9-13 th week		5%
4	Assessment 4	14 th week	1hr	20%
CPA	Compensation Assessment*	15 th week	1hr	20%
5	Final Assessment *	17 th week	3 hrs	50%

*mandatory; refer to guidelines on page 4

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

1. Students can contact the faculty by person in my cabin also by mail/phone or whatsapp between 9 AM to 8 PM. The doubts or clarification can be sent by any mode and it will be resolved within an hour or maximum in 1 day.
vshanthi@nitt.edu/ matshavembu@gmail.com/ 9487440341

COURSE POLICY (including compensation assessment to be specified)

- a. Students who have missed either assessment 2 or assessment 4 or both can appear for compensation assessment which shall be conducted soon after the completion of the assessment 4 and before the final assessment.

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.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

FOR APPROVAL

V. She
V-She
Course Faculty _____

Jaba
06/09/2023
CC- Chairperson (*JITRAJ SATHA*) _____

HOD *[Signature]* *27/9/23*