



Course Syllabus
Gyanmanjari science college
Semester-1(M.Sc.)

Subject: Differential Equations- MSCMA11504

Type of course: Major

Prerequisite: The Lipschitz condition , The legendre's equation , Bessel' functions

Rationale: The study of differential equations requires a solid understanding of several mathematical concepts.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks					Total Marks
CI	T	P		Theory Marks		Practical Marks		CA	
			ESE	MSE	V	P	ALA		
4	0	0	4	60	30	10	00	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.



Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1.	Analysis : Faculty will assign scientific pictures and students will analyze and prepare a report in 100 words and upload it to Moodle.	10
2.	Concept mapping : Faculty will assign real time project / problem that Students map their Idea, Solution for real time project / problem and upload it to Moodle	10
3.	Puzzle : Various problems based on series, geometry, clock, calendar, etc. will be assigned to the students. Students need to submit Mathematical logic and Solution via moodle.	10
4.	Brain writing : Faculty will provide a picture, text passage or video clip, student observe, analyze and write about it.	10
5.	Chain notes : Faculty will provide a topic on that students have to prepare a series based on topic in chart form in hard copy and upload it to moodle.	10
Total		50

Course Content:

Unit No.	Course content	Hrs	% Weightage
1.	Chapter : 1 <ul style="list-style-type: none"> ➤ Existence and uniqueness of solutions to the first order equations. ➤ The method of successive approximations. ➤ The Lipschitz condition. ➤ Approximations and uniqueness of solutions. 	15	25



2.	Chapter : 2 <ul style="list-style-type: none"> ➤ Linear equations with variable coefficient. ➤ Homogeneous equations with analytic coefficient. ➤ The legendre's equation, Legendre's polynomial and its properties. ➤ Bessel's equations, Bessel's functions and its properties. 	15	25
3.	Chapter : 3 <ul style="list-style-type: none"> ➤ Sturm Liouville's problem. ➤ Eigen functions of Sturm Liouville's problem. ➤ Orthogonality of eigen functions. ➤ Simultaneous differential equations of the first order and first degree method . ➤ Method of P Q R solutions 	15	25
4.	Chapter : 4 <ul style="list-style-type: none"> ➤ First order partial differential equations. ➤ Cauchy's problem, Linear partial differential equations with constant coefficients. ➤ Reduction to canonical forms. ➤ Applications of differential equations. ➤ Method of separation of variables to solve the wave equations. ➤ Problems of Fourier series. ➤ Application to one dimensional wave equations. 	15	25

Suggested Specification table with Marks (Theory) : 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	10%	40%	20%	10%	20%	0

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.



Course Outcome:

After learning the course the students should be able to:	
CO1	Learn concept of the Lipschitz condition of differential equations.
CO2	Understand of Legendre's equation, its importance in and its applications.
CO3	Explore the properties of Bessel functions, including order, recurrence relations.
CO4	Solve the methods learned to solve one-dimensional wave equations..

Instructional MethodS:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

- [1] Coddington, E.A., An introduction to ordinary differential equations, Prentice Hall of India
- [2] Sneddon, Ian N.: Elements of Partial Differential Equations, McGraw-Hill Book Company, 1988.
- [3] Simmons, G.F., Differential equations with Applications, Tata McGraw Hill.

