Department of Mathematical and Computational Sciences
National Institute of Technology Karnataka, Surathkal
Course Plan and Evaluation Plan

Course Code	: MA111
Course Title	: Engineering Mathematics - II
L-T-P	: 3-0-0 (Credits 03)
Course Instructor	: Dr. P. Sam Johnson https://sam.nitk.ac.in/
Course Webpage	: https://sam.nitk.ac.in/MA111.html
Teaching Department	: Mathematical and Computational Sciences (MACS)
Course coverage	: 40hrs Lecture Schedule

Objective of the course

To expose the students to the concepts of sequence, series and differential equations so that they will be able to

- Apply $\epsilon - N$ definition, the Sandwich Theorem and the Monotone Sequence Theorem for testing the convergence of sequences.
- Apply the n-th term test, Integral Test, Cauchy's Condensation Test, Comparison Test, Ratio and Root tests, the Absolute convergence Test and the Alternating series Test to test the convergence of series.
- Apply Taylor's Theorem to find power series expansion of infinitely differentiable functions and use Fourier series to find series expansion for certain periodic functions.
- Solve some 1st order differential equations like separable differential equations, exact differential equations, 1st order linear differential equations.
- Analyze whether an Initial Value Problem consisting of a homogeneous linear homogeneous differential equation of n-th order and n initial conditions has a unique solution or not using the Wronskian.
- Apply the power series method for solving linear ODEs with variable coefficients.

Skill development of the student expected from the course

Understanding convergence of a sequences; tests for convergence of series; Fourier series and techniques to solve ordinary differential equations.

Contents

- Sequences: Definition of convergence; examples using $\epsilon - N$ definition; properties; Monotonic sequences; subsequences. [Section 10.1 of Text 1].
- Infinite Series: Definition of convergence; Tests for convergence (n-th term test, Integral Test, Cauchy's Condensation Test, Comparison Test, Absolute convergence, Ratio and root tests); Alternating series and conditional convergence, Rearranging series; Power series. [Sections 10.2 to 10.7 of Text 1].
- Taylor and Maclaurin Series; Convergence of Taylor Series. [Sections 10.8 & 10.9 of Text 1].
- Fourier series.[Sections 11.1 and 11.2 of Text 2].
- Ordinary Differential Equations(ODE): First order ODE - various methods; Initial value problems - Picard's iteration, Conditions for existence and uniqueness of solution to an IVP. [Sections 1.1, 1.2, 1.3, 1.4, 1.5, 1.7 of Text 2].
- Second and higher order linear DEs with constant coefficients, Method of reduction of order, general solution for homogeneous equations (characteristic equations); Super-position principle, Euler-Cauchy equations, Particular integrals.[Sections 2.1, 2.2, 2.5 of Text 2].
- Second order linear ODEs with variable coefficients: Existence and uniqueness - Wronskian; Method of variation of parameters, Higher Order Linear ODEs.[Sections 2.6, 2.7, 2.10, 3.1, 3.2, 3.3 of Text 2].
- Series solutions.[From Ch. 5 of Text 2].

Textbooks

1. J. Hass, C. Heil and M.D. Weir, Thomas' Calculus, 14th Edition, Pearson.
2. E. Kreyszig: *Advanced Engineering Mathematics*, 10th Ed., John Wiley & Sons.

References

1. N. Piskunov: *Differential and Integral Calculus*, Vol I & II (Translated by George Yankovsky).
2. G.F. Simmons: *Differential Equations with Applications and Historical Notes*, 2nd Ed., McGraw- Hill, 1991.
3. E.A. Coddington: *An Introduction to Ordinary Differential Equations*, PHI Learning 1999.
4. S. C. Malik, Savita Arora: *Mathematical Analysis*, New Age Publ, New Delhi.

Evaluation Plan

Sl.No.	Exam	Syllabus(Tentative)	%	Date of Exam (Tentative)
1	Quiz-1	Upto 10.4 of Text 1	10	January 29, 2024
2	Mid semester	Upto 10.9 of Text 1	25	February 12, 2024
3	Quiz-2	Upto 2.5 of Text 2	15	March 11, 2024
4	End semester	The entire syllabus	50	April 01, 2024