NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF MATHEMATICS

COURSE PLAN – PART I			
Name of the programme and specialization	B-Tech CSE		
Course Title	Linear Algebra and Calculus		
Course Code	MAIR12	No. of Credits	3
Course Code of Pre-requisite subject(s)	-	-	-
Session	July 2023	Section (if, applicable)	A
Name of Faculty	Dr. Balasubramani N	Department	Mathematics
Official Email	balasubramani@nitt.edu	Telephone No.	9435889735
Name of Course Coordinator(s) (if, applicable)	-		
Official E-mail	-	Telephone No.	-
Course Type (please tick appropriately)	√ Core course	☐ Elective course	

Syllabus (approved in BoS)

Vector space – Subspaces – Linear dependence and independence – Spanning of a subspace– Basis and Dimension. Inner product – Inner product spaces – Orthogonal and orthonormal basis – GramSchmidt orthogonalization process. Linear transformation. Eigenvalues and eigenvectors; Diagonalization ofmatrices; Cayley-Hamilton Theorem. Quadratic form

Sequence and series: Convergence of sequence. Infinite Series-Tests for Convergence-Integral test, comparison test, Ratio test, Root test, Raabe's test, Logarithmic test and Leibnitz's test; Power series;

Functions of two variables: Limit, continuity and partial derivatives; Totalderivative, Jacobian, Taylor series, Maxima,minima and saddle points; Method of Lagrange multipliers; Double and triple integrals, change of variables, multiple integral in cylindrical and spherical coordinates.

References

1. Dennis Zill, Warren S. Wright, Michael R. Cullen, *Advanced Engineering Mathematics*, Jones & Bartlett Learning, 2011
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 2019.
3. Strauss M.J, G.L. Bradley and K.J. Smith, *Multivariable Calculus*, Prentice Hall, 2002.
4. Ward Cheney, David Kincaid, *Linear Algebra: Theory and Applications*, Jones & Bartlett Publishers, 2012.

COURSE OBJECTIVES

1. Introduce vector space and inner product space and it properties.
2. Introduce eigen value and eigen vectors and its properties.
3. Discuss the convergence of infinite series.
4. Analyze and discuss the extrema of the functions of several variables.
5. Evaluate the multiple integrals and apply in solving problems.

MAPPING OF COs with POs

Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)
1. Understand the concepts of vector spaces, bases, dimension, inner product spaces and orthoganalization of the basis.	PO1
2. Predict diagonalizability of a given square matrix and categorize its quadratic form, using Eigenvalues and Eigenvectors.	PO1
3. Select proper test and apply it to determine the convergence/divergence of an infinite series.	PO1
4. Compute Jacobians, Taylor's series and identify local extremes of function of a several variables.	PO1
5. Evaluate multiple integrals and use it in physical/engineering applications.	PO1

COURSE PLAN – PART II

COURSE OVERVIEW

This course will introduce:

1. Importance of vector spaces and inner product spaces.

2. Various test to determine the convergence of infinite series.

3. Function of two variables.

4. Multiple integrals in cylindrical and spherical coordinates.

COURSE TEACHING AND LEARNING ACTIVITIES (Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	Week 1	Vector space and Subspaces.	Chalk and Talk

2	Week 2	Linear dependence and independence, Spanning of a subspace.	Chalk and Talk
3	Week 3	Basis and Dimension, Inner product spaces.	Chalk and Talk
4	Week 4	Orthogonal and orthonormal basis, GramSchmidt orthogonalization process.	Chalk and Talk
5	Week 5	Linear transformation, Eigenvalues and eigenvectors, Diagonalization of matrices.	Chalk and Talk
6	Week 6	Cayley-Hamilton Theorem, Quadratic form	Chalk and Talk
7	Week 7	Sequence and series: Convergence of sequence. Infinite Series, Tests for Convergence.	Chalk and Talk
8	Week 8	Integral test, comparison test	Chalk and Talk
9	Week 9	Ratio test, Root test, Raabe's test	Chalk and Talk
10	Week 10	Logarithmic test and Leibnitz's test, Power series	Chalk and Talk
11	Week 11	Functions of two variables: Limit, continuity and partial derivatives, Total derivative	Chalk and Talk
12	Week 12	Jacobian, Taylor series, Maxima, minima and saddle points	Chalk and Talk
13	Week 13	Method of Lagrange multipliers, Double and triple integrals, change of variables	Chalk and Talk
14	Week 14	Multiple integral in cylindrical and spherical coordinates.	Chalk and Talk

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment 1 (Written test)	6th week	1 hour	20
2	Assessment 2 (Written test)	12th week	1 hour	20
3	Assessment 3 (Assignments)			10
CPA	Compensation Assessment*	15th week	1 hour	
4	Final Assessment *	As per academic schedule	3 hour	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 meet the faculty (with prior appointment) at any stage in the course duration in case he/she finds difficulty in understanding the topic.

2. Feedback form issued to students to express their comments about the course before Assessment -1, and after completing the syllabus. Students are requested to give genuine feedback about the course.

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

COURSE POLICY (including compensation assessment to be specified)

Mode of Correspondence: Students can meet the faculty by fixing appointment through E-mail (balasubramani@nitt.edu) or phone call (9435889735) between 9.30 am to 5.30 pm in the working days.

Compensation Assessment Policy: Only the students who are absent in any of the Assessment Tests (or both) with genuine reasons (medical emergencies /On Duty) will be allowed to write the compensation test. Students are strictly not allowed to enroll for compensation assessment to improve their marks.

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.
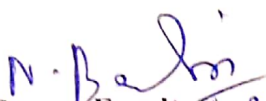
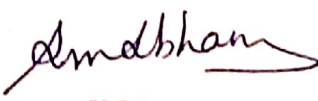## ACADEMIC DISHONESTY & PLAGIARISM

- 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

Course Faculty 6.9.23	CC- Chairperson 8/9/23	HOD
(Dr. Balasubramani N)	(Dr. Rajeswari Sridhar)	(Dr. Mary Saira Bhanu)

Guidelines

a) The number of assessments for any theory course shall range from 4 to 6.

b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.

c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.

d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.

f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.

g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.