NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI

DEPARTMENT OF MATHEMATICS

COURSE PLAN – PART I			
Name of the programme and specialization	**B.Tech, Civil Engineering, I Year**		
Course Title	Matrices and Calculus		
Course Code	MAIR 11	**No. of Credits**	03
Course Code of Pre-requisite subject(s)	NIL		
Session	July, 2023	**Section (if, applicable)**	B
Name of Faculty	Dr. N. Shivaranjani	**Department**	Mathematics
Email	ranjani@nitt.edu	**Telephone No.**	(+91) 9159177345
Name of Course Coordinator(s) (if, applicable)	--		
E-mail		**Telephone No.**	
Course Type	**General Institute Requirements (BSC)**		

Syllabus (approved in BoS)

Eigenvalues and eigenvectors; Diagonalization of matrices; 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; Total derivative, 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.

Gradient, divergence and curl; Line and surface integrals; Green's theorem, Stokes theorem and Gauss divergence theorem (without proofs).

ESSENTIAL READINGS : (Textbooks, reference books etc.)

- Dennis Zill, Warren S. Wright, Michael R. Cullen, Advanced Engineering Mathematics, Jones & Bartlett Learning, 2011.
- Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2019
- Jerrold E. Marsden, Anthony Tromba, Vector Calculus, W. H. Freeman, 2003.

- Strauss M.J, G.L. Bradley and K.J. Smith, Multivariable calculus, Prentice Hall, 2002.
- Ward Cheney, David Kincaid, Linear Algebra: Theory and Applications, Jones & Bartlett Publishers, 2012

COURSE OBJECTIVE

To

- Introduce eigenvalue and eigenvectors and their properties.
- Determine canonical form of the given quadratic form.
- Discuss the convergence of infinite series.
- Analyze and discuss the extrema of functions of several variables.
- Evaluate the multiple integrals and apply in solving problems.
- Introduce vector differential operator for vector function and important theorems on vector functions to solve engineering problems.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
On completion of the course, students will be able to • compute eigenvalues and eigenvectors of the given matrix. • transform given quadratic form into canonical form. • discuss the convergence of infinite series by applying various tests. • compute partial derivatives of functions of several variables. • write Taylor's series for functions with two variables. • evaluate multiple integral and its apply it in finding area, volume. • compute the dot product of vectors, lengths of vectors, and angle between vectors. • perform gradient, div, curl operator on vector functions and give physical interpretations. • use Green's, Gauss divergence and Stoke's theorems to solve engineering problems.	(i) Identify, formulate and analyze engineering problems through technical literature, and (ii) apply knowledge of mathematics to arrive at solutions.

COURSE PLAN – PART II

COURSE OVERVIEW

This course will introduce;

1. importance of eigenvalues and eigenvectors, matrix diagonalization.
2. the notion of convergence of a series and various tests associated with it.
3. multivariable calculus.
4. the concepts of gradient, curl, divergence and associated theorems.

COURSE TEACHING AND LEARNING ACTIVITIES

Sr.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	1st & 2nd weeks	Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem. Quadratic form.	Chalk and talk

2.	3rd , 4th & 5th weeks	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.	Chalk and talk
3.	6th Week	**Assignment -1**	
4.	6th Week	**Assessment -1**	**Written Test**
5.	7th,8th & 9th weeks	Functions of two variables: Limit, continuity and partial derivatives; Total derivative, 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.	Chalk and talk
6.	10th ,11th weeks	Gradient, divergence and curl; Line and surface integrals; Green's theorem, Stokes theorem and Gauss divergence theorem (without proofs).	Chalk and talk
7.	12th Week	**Assignment -2**	
8.	12th Week	**Assessment - 2**	**Written Test**
9.	13th Week	Revision and doubt clearing session.	Chalk and talk
10.	13th Week	Compensation Assessment	**Written Test**
11.	After 13th Week	**Final Assessment (Assessment -3)**	**Written Test**

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week / Date	Duration	% Weightage
1.	Assessment 1	6th Week	1.5 hour	20%

	(Written Test)			
2.	Assessment 2 (Written Test)	12th Week	1.5 hour	20%
3.	Assignments			10%
CPA	Compensation Assessment * (Written Test)	13th Week		
4.	Final Assessment# (Assessment -3, Written Test)	After 13th Week	3 hours	50%

* One compensation assessment for absentees in the assessments (other than the final assessment) will be conducted comprising the syllabus of both Assessment-1 and Assessment-2. Only genuine cases of absence shall be considered.

Minimum 20% must be secured in the Final Assessment for passing the course.

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

The institute follows relative grading with flexibility given to teachers to decide the marks range for grades. All assessments of a course will be done on the basis of marks.

MODE OF CORRESPONDENCE (email / phone etc)

Students can meet the course faculty by fixing appointment through E-mail or phone call between 8:30 am and 4:30 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

FOR APPROVAL

Dr.N.Shivaranjani
(Course Faculty)

CC-Chairperson

HOD