NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF MATHEMATICS

COURSE PLAN – PART I			
Name of the programme and specialization	**B.Tech – Mechanical (Section-A)**		
Course Title	**Matrices and Calculus**		
Course Code	**MAIR 11**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**Nil**		
Session	**July 2022**	**Section**	**A**
Name of Faculty	**Dr. V. Lakshmana Gomathi Nayagam and P. Daniel**	**Department**	**Mathematics**
Official Email	**velulakshmanan@nitt.edu/ 416121004@nitt.edu**	**Telephone No.**	**9443881718 / 9524094803**
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)

Eigenvalues and eigenvectors;Diagonalization ofmatrices;Cayley-HamiltonTheorem. 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).

COURSE OBJECTIVES

- Introduce eigen value and eigen vectors and its properties.
- Determine canonical form of given quadratic form.
- Discuss the convergence of infinite series.
- Analyse and discuss the extrema of the 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

MAPPING OF COs with POs	
Course Outcomes	**Programme Outcomes (PO)**
1. Compute eigenvalues and eigenvectors of the given matrix.	a,b
2. Transform given quadratic form into canonical form.	a,b
3. Discuss the convergence of infinite series by applying various test.	a,b
4. Compute partial derivatives of function of several variables.	a,b
5. Write taylor's series for functions with two variables.	a,b
6. Evaluate multiple integral and its applications in finding area, volume.	a,b
7. Compute the dot product of vectors, lengths of vectors, and angles between vectors.	a,b
8. Perform gradient, div, curl operator on vector functions and give physical interpretations.	a,b
9. Use green's, gauss divergence and stoke's theorems to solve engineering problems.	a,b

COURSE PLAN – PART II

COURSE OVERVIEW

To understand the mathematical applications to engineering problems using matrix theory, convergence concepts, functions of several variables and multiple integrals.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
	Week 1	1. Review of basic definitions on Matrix Theory. 2. Finding Eigen values and Eigen vectors. 3. Finding the eigen values for symmetric matrices and Properties of Eigen values and Eigen vectors.	Chalk and Talk/ PPT
	Week 2	4. Cayley Hamilton Theorem (CHT)- without proof-verification. 5. Applications of CHT. 6. More problems + Tutorial.	Chalk and Talk/ PPT

	Week 3	7. Diagonalization-problems. 8. Quadratic forms- required definitions. 9. Problems + Tutorial.	Chalk and Talk/ PPT
	Week4	10. Revision on Sequences. 11. Convergence of sequences 12. Infinite series-definitions-series of +ve terms.	Chalk and Talk/ PPT
	Week5	12. Test for convergence. 13. Power series and its convergence 14. Problems using the tests.	Chalk and Talk/ PPT
	Week6	16. More problems. 17. Alternating series- Leibnitz test 18. More problems.	Chalk and Talk/ PPT
		Assessment-I	
		Assessment-II	
	Week7	19. Functions of two variables 20. Problems for max., min. 21. Lagrange multipliers.	Chalk and Talk/ PPT
	Week8	22. Jacobian and its properties 23. Taylor series. 24. Some problems.	Chalk and Talk/ PPT
	Week9	25. Concept of integration 26. Double and triple integration. 27. Change the order of integration	Chalk and Talk/ PPT
	Week10	28. Applications of double integral 29. multiple integral in cylindrical and spherical coordinates 30. Conversion-problem	Chalk and Talk/ PPT

		Assessment-III **Assessment-IV**	
	Week11	31. Gradient, 32. divergence and curl; 33. Problems	Chalk and Talk/ PPT
	Week12	34. Line integral 35. Surface integral 36. Problems	Chalk and Talk/ PPT
	Week13	37. Green's theorem, 38. Stokes theorem and Gauss divergence theorem (without proofs). 39. Problems	Chalk and Talk/ PPT
	Week14	40. Revision and more problems **Compensation Assessment**	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment –I (Assignment)	6th week		5%
2	Assessment-II	6th week	1 Hour	20%
3	Asssessment- III (Assignment)	10th week		5%
4	Assessment –IV	10th week	1 Hour	20%
5	Compensation Assessment*	14th week	1 Hour	
6	Final Assessment *		3 Hours	50%
				Total : 100 Marks

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

COURSE POLICY (including compensation assessment to be specified)

Assessment 1 and 3 are descriptive in nature, which are problem-solving assignments. Assessment 2 and 4 are written exams each with 2 units from the syllabus approved. Compensation assessment is also a written exam of cumulative syllabus of assessment 2 and 4.

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 V. Balaji P. Dhanalakshmi **CC- Chairperson** 24/11/22 **HOD** 24/11/2022