NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	B.Tech. in Chemical Engineering		
Course Title	Matrices and Calculus		
Course Code	MAIR11	No. of Credits	3
Course Code of Pre-requisite subject(s)	NIL		
Session	July 2022	Section (if, applicable)	-
Name of Faculties	Dr. N. Prakash Ms. K.V. Sangeetha	Department	Mathematics
Email	prakashn@nitt.edu 416118053@nitt.edu	Mobile No.	7845688072 9360357183
Name of Course Coordinator(s) (if, applicable)	NIL		
E-mail	-	Telephone No.	-
Course Type	√ Core course ☐ Elective course		

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 integrals in cylindrical and spherical coordinates.

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

ESSENTIAL READINGS : (Textbooks, reference books etc.)

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. Jerrold E. Marsden, Anthony Tromba, Vector Calculus, W. H. Freeman, 2003.
4. Strauss M.J, G.L. Bradley and K.J. Smith, Multivariable calculus, Prentice Hall, 2002.
5. Ward Cheney, David Kincaid, Linear Algebra: Theory and Applications, Jones & Bartlett Publishers, 2012.

The course objective is to

1. Familiarize eigenvalues and eigenvectors of a square matrix and their properties. Classify quadratic forms and explain the convertion of a given quadratic form into cannonical form.
2. Introduce various convergence tests to discuss the behaviour of sequences and infinite series of real numbers.
3. Introduce limit, continuity, derivative of function of two variables, and discuss the maxima and minima of them.
4. Explain the essence of multiple integrals and their applications in evaluating area and volume.
5. Discuss Green's theorem, Divergence theorem and Stoke's theorem to solve problems.

Mapping of COs with POs

Course Outcomes (COs)	**Aligned Programme Outcomes (POs)**
On completion of this course students will be able to	
1. Compute eigenvalues and eigenvectors of the given matrix. Transform given quadratic form into canonical form. 2. Discuss the convergence of infinite series by applying various test. 3. Compute partial derivatives of function of several variables. Write Taylor's series for functions of two variables. 4. Evaluate multiple integral and its applications in finding area, volume. 5. Solve engineering problems using Green's theorem, Divergence theorem and Stoke's theorem.	**1,5**

COURSE PLAN – PART II

COURSE OVERVIEW

This course will introduce

1. Eigenvalues and eigenvectors of a martix and their applications.
2. Convergence of seqences and infinite series of real numbers.
3. Functions of several variables and their properties.
4. Multiple integrals and their applications in engineering problems.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	1st , 2nd & 3rd Week	Eigen values and Eigen vectors – Properties of Eigen values – Diagonalization of matrix – Cayley-Hamilton Theorem (without proof) verification – Quadratic form – Orthogonal reduction of quadratic form to canonical form.	**Chalk & Talk**
2.	4th & 5th Week	Functions of two variables – Limit, continuity, partial derivative –Total derivatives– Jacobian and its Properties–Taylor series–Maxima and Minima–Method of Lagrange's multipliers.	**Chalk & Talk**

3.	6th Week	**Assessment - 1**	
4.	6th,7th& 8th Week	Double integral – Changing the order of Integration – Change of variables from Cartesian to Polar Coordinates – Triple integral - Multiple integrals in cylindrical and spherical coordinates.	**Chalk & Talk**
5.	9th& 10th Week	Introduction to sequences. Infinite series – Convergence Tests for positive term series – Comparison, Integral test, Root test, Ratio test.	**Chalk & Talk**
6.	11th & 12th Week	Raabe's test, Logarithmic test. Alternating series – Leibnitz's rule – Absolute and Conditional Convergence – Power series.	**Chalk & Talk**
7.	12th Week	**Assessment - 2**	
8.	13th & 14th Week	Gradient, divergence and curl –Line and surface integrals – Green's theorem, Gauss divergence theorem, Stokes theorem (without proof – problems only).	**Chalk & Talk**

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week / Date	Duration	% Weightage
1.	**Assessment - 1**	**6th Week**	**60 minutes**	**20%**
2.	**Assessment – 2**	**12th Week**	**60 minutes**	**20%**
3.	**Assessment - 3 (Assignments)**			**10%**
4.	**Final Assessment**	**After 14th Week**	**3 hours**	**50%**
CPA	**Compensation Assessment**	**14th Week**	**60 minutes**	**20%**

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

1. Feedback from the students during class committee meetings.
2. Feedback form will be 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.

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

1. Students can contact the faculty over phone: **+91-7845688072 / +91-9360357183** or e-mail: **prakashn@nitt.edu / 416118053@nitt.edu.**

2. **Students who have missed either Assessment-1 or Assessment-2 or both can register for Compensation Assessment which shall be conducted soon after the completion of the Assessment-2 and before the Final Assessment.**

3. **The Compensation Assessment shall be conducted for the weightage of 20% comprising the syllabus of both Assessment-1 and Assessment-2.**

4. **Students who get "F" grade or "X" grade due to genuine reason and satisfactory attendance in the course will be allowed for Reassessment (Supplementary Examination).**

5. **Students who get "V" grade must compulsorily Redo the course.**

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.

FOR APPROVAL

23/11/22

Ms. K.V. Sangeetha

N. Prakash 23/11/2022

Dr. N. Prakash
(Course Faculties)

CC-Chairperson
(Dr. K.V. Sangeetha)

M. P. 25/11/22

HOD