



DEPARTMENT OF MATHEMATICS

COURSE PLAN – PART I			
Name of the programme and specialization	B. Tech. / Chemical Engineering		
Course Title	Matrices and Calculus		
Course Code	MAIR 11	No. of Credits	3
Course Code of Pre-requisite subject(s)	-		
Session	August 2019	Section (if, applicable)	-
Name of Faculty	Dr. R. Tamil Selvi	Department	Mathematics
Official Email	tamil@nitt.edu	Telephone No.	7598176202
Name of Course Coordinator(s) (if, applicable)	-		
Official E-mail		Telephone No.	
Course Type (please tick appropriately)	<input checked="" type="checkbox"/> Core course	<input type="checkbox"/> Elective course	
<b>Syllabus (approved in BoS)</b>			
<b>MAIR 11- MATRICES AND CALCULUS</b>			
Eigenvalues and eigenvectors; Diagonalisation 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).			
<b>Reference Books:</b>			
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.			



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### COURSE OBJECTIVES

The course objective is to

1. Introduce the concepts of eigenvalues and eigenvectors of a matrix and study their properties.
2. Diagonalize a matrix and to transform a quadratic form into the canonical form.
3. Discuss the convergence of infinite series.
4. Introduce limit, continuity and derivative of function of several variables.
5. Discuss Taylor series and maxima and minima of functions of several variables.
6. Explain the concept of multiple integrals and to study their applications.
7. Introduce the vector operators and theorems on line, surface integrals.

### MAPPING OF COs with POs

Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)
<p>On completion of this course students will be able to</p> <ol style="list-style-type: none"> <li>1. Diagonalize a matrix and transform a given quadratic form into the Canonical form through eigen values and eigen vectors.</li> <li>2. Determine the convergence of infinite series by applying different tests.</li> <li>3. Compute partial derivatives for the functions of several variables and express in Taylor's series.</li> <li>4. Determine maxima and minima of functions of two variables.</li> <li>5. Evaluate multiple integrals and apply them to find area and volume.</li> <li>6. Perform line and surface integrals.</li> </ol>	<p>Ability to apply mathematical foundations in modelling and design of computer based systems.</p> <p>Ability to design and conduct experiments as well as to analyze and interpret data.</p>

### COURSE PLAN – PART II

#### COURSE OVERVIEW

1. Introduce eigenvalues and eigenvectors of a matrix, Diagonalization of a matrix and several types of quadratic forms.
2. Study the convergence of sequences and infinite series of real numbers.
3. Explain the derivative concepts for functions of several variables and their applications in finding extrema.
4. Discuss the multiple integrals and their applications.

#### COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery



1	1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> week (7 hrs)	Eigenvalues and eigenvectors; Diagonalisation of matrices; Cayley-Hamilton Theorem. Quadratic form.	Chalk &Talk
2	3 <sup>rd</sup> , 4 <sup>th</sup> , 5 <sup>th</sup> and 6 <sup>th</sup> week (10 hrs)	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 &Talk
3	6 <sup>th</sup> Week	<b>ASSESSMENT-I</b>	
4	7 <sup>th</sup> , 8 <sup>th</sup> , 9 <sup>th</sup> , 10 <sup>th</sup> , 11 <sup>th</sup> Week (13 hrs)	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 &Talk
5	11 <sup>th</sup> week	<b>ASSESSMENT-II</b>	
6	11 <sup>th</sup> , 12 <sup>th</sup> , 13 <sup>th</sup> (7 hrs)	Gradient, Divergence and Curl, Line, surface and volume integrals, Green's Theorem, Stokes' Theorem and Gauss Divergence Theorem (all without proof)	Chalk &Talk

**COURSE ASSESSMENT METHODS** (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment 1	6 <sup>th</sup> week	1 hour	20
2	Assessment 2	11 <sup>th</sup> Week	1 hour	20
3	Assessment 3 (Assignments)			10
CPA	Compensation Assessment*	14 <sup>th</sup> week	1 hour	20



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4	Assessment – 4 (Final Assessment)	After 14 <sup>th</sup> week	3 hours	50
<b>COURSE EXIT SURVEY</b> (mention the ways in which the feedback about the course shall be assessed)				
<ol style="list-style-type: none"> <li>1. Students can meet the faculty at any stage in the course duration in case he/she finds difficulty in understanding the concept.</li> <li>2. Feedback form issued to students to express their comments about the course before Assessment -I &amp; after completing the syllabus. Students are requested to give genuine feedback about the course.</li> <li>3. Student knowledge about the topic covered in this course will be judged through marks obtained in examination.</li> </ol>				
<b>COURSE POLICY</b> (including compensation assessment to be specified)				
<ol style="list-style-type: none"> <li>1. Students who have missed the assessment 1 or assessment 2 or both (genuine reasons with proof) can register for compensatory assessment which shall be conducted soon after the completion of the assessment 2 and before the regular semester examination. Other students were strictly NOT allowed to register for compensation assessment.</li> <li>2. The compensation assessment shall be conducted for 20 marks comprising the syllabus of both assessment 1 and assessment 2.</li> <li>3. Students should submit assignments before last date of submission. In case students fails to submit their assignments, he/she will get zero mark for that particular assignment.</li> <li>4. The Institute follows relative grading with flexibility given to class committee to decide the mark ranges for grades. All assessment of a course will be done on the basis of marks</li> <li>5. If the students fail to appear semester examination due to genuine/medical reason, can register for special end semester examination after approval from course teacher &amp; Head of department of Mathematics. The special end semester examination will be conducted within a month from reopening of institute for next semester. Students should register their names with course teacher to appear for special end semester examination within three days/schedule given office of Dean(academic) from reopening of institute for next semester. Grade issued as per the guidelines followed for his/her batch students.</li> <li>6. There will be one Reassessment for the students who have secured “F” in this course and will be conducted within a month from reopening of institute for next semester. Students should register their names with course teacher to appear for reassessment within three days from reopening of institute for next semester. If the students satisfy</li> </ol>				



the criteria fixed by the faculty to promote E grade will be given E grade and others given 'F' grade.

**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.

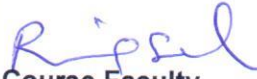
**ACADEMIC DISHONESTY & PLAGIARISM**

- 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**

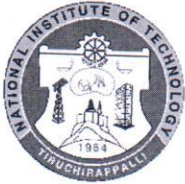
Students can meet the course faculty for discussion on working days in the department of Mathematics, Lyceum block, room no.216.

**FOR APPROVAL**

  
Course Faculty  
Dr. R. TAMIL SELVI

  
CC- Chairperson  
Dr. T. SIVASANKAR

  
HOD  
Dr. K.M. MEERA S. BEGUM



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### 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.