

**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**

**DEPARTMENT OF HUMANITIES & BASIC SCIENCES**

# **MATRICES AND CALCULUS**

S&H

Prepared by  
Mr. M.Leela  
Associate Professor

**H&S**

**M & C**

**I YEAR**

**I SEM**



**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**  
(an Autonomous Institution)

S.NO	NAME OF FILE	(Y/N)
1	Institute V/M	Y
2	Department V / M /PEO	Y
3	POs /PSOs	Y
4	Course Syllabus with Structure	Y
5	Course Outcomes (CO)	Y
6	Mapping CO with PO/PSO; Course with PO/PSO with Justification	Y
7	Academic Calendar	Y
8	Time table - highlighting your course periods including tutorial	Y
9	Lesson plan with number of hours/periods, TA/TM, Text/Reference book	Y
10	Gap within the syllabus - mapping to CO, PO/PSO	
11	Gaps beyond the syllabus - Mapping to PO/PSO	
12	Gaps addressed by a resource person - document	
13	Gaps addressed by any other teaching aid/methodology	
14	Web references	Y
15	Lecture notes	Y
16	List of Power point presentations / Videos	Y
17	CD with PPT/Videos	
18	University Question papers	Y
19	Internal Question papers, Key with CO and BT	Y
20	Assignment Question papers mapped with CO and BT	Y
21	Scheme of evaluation with CO and BT mapping	Y
22	Tutorial topics with evidence	Y
23	Result Analysis to identify weak and advanced learners - 3 times in a semester	Y
24	Result Analysis at the end of the course	
25	Remedial class for weak students - schedule and evidences	Y
26	Advance Learners- Engagement documentation	Y
27	Course Assessment (Plan & Execution)	
28	CO, PO/PSO attainment sheets	Y
29	Observation for not attaining CO or for improvement	
30	Plan of action to improve CO attainment next time	
31	Attendance register (Theory/Tutorial/Remedial) - Teacher/Course delivery record; Continuous evaluation	Y
32	Course file (Digital form)	Y

HOD



**Sri Indu College of Engineering & Technology :: Sheriguda (V), R.R.Dist  
Department of Electronics & Communication Engineering**

**DEPARTMENT OF**  
**HUMANITIES & BASIC SCIENCES**  
**COURSE FILE**

**Branch: ECE**

**Class: B.Tech- I Year- I SEM**

**Subject: MATRICES & CALCULUS**

**Code: R22MTH1111**

**Academic Year: 2022-23**

**Regulation: R22**

**Core/Elective/H&S: H&S**

**Credits: 04**

**No of Theory Periods per week: 03**

**No of Tutorial Periods per week: 01**

**Prepared By**

**Name: M.Leela**

**Designation: Associate Professor**

**Verified By**

**Head of the Department:**

**Name:**

**IQAC CO-ORDINATOR**



**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**  
**B. TECH –ELECTRONICS & COMMUNICATION ENGINEERING**

**INSTITUTION VISION**

To be a premier Institution in Engineering & Technology and Management with competency, values and social consciousness.

**INSTITUTION MISSION**

- IM<sub>1</sub>** Provide high quality academic programs, training activities and research facilities.
- IM<sub>2</sub>** Promote Continuous Industry-Institute interaction for employability, Entrepreneurship, leadership and research aptitude among stakeholders.
- IM<sub>3</sub>** Contribute to the economical and technological development of the region, state and nation.

**PRINCIPAL**



**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**  
**B. TECH –ELECTRONICS & COMMUNICATION ENGINEERING**

**DEPARTMENT VISION**

To be a centre of excellence in Electronics and Communication Engineering Education to produce professionals for ever-growing needs of society.

**DEPARTMENT MISSION**

The Department has following Missions:

- DM<sub>1</sub>** To promote and facilitate student - centric learning.
- DM<sub>2</sub>** To involve in activities that enable overall development of stakeholders.
- DM<sub>3</sub>** To provide holistic environment with state-of-art facilities for students to develop solutions for various social needs.
- DM<sub>4</sub>** Organize trainings in embedded systems with Industry interaction.

**Head of the Department**



SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY  
B. TECH –ELECTRONICS & COMMUNICATION ENGINEERING

**PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

<b>PEO1</b>	<b>Higher Studies:</b> Graduates with an ability to apply knowledge of Basic Sciences and programming skills in their career and higher education.
<b>PEO2</b>	<b>Lifelong Learning:</b> Graduates with an ability to adopt new technologies for ever changing IT industry needs through Self-Study, Critical thinking and Problem solving skills.
<b>PEO3</b>	<b>Professional Skills :</b> Graduates will be ready to work in projects related to complex problems involving multidisciplinary projects with effective analytical skills
<b>PEO4</b>	<b>Engineering citizenship:</b> Graduates with an ability to communicate well and exhibit social, technical and ethical responsibility in process or product.

**Head of the Department**



SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY  
B. TECH –ELECTRONICS & COMMUNICATION ENGINEERING

**PROGRAM OUTCOMES (POs) & PROGRAM SPECIFIC OUTCOMES (PSOs)**

PO	Description
PO 1	<b>Engineering Knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	<b>Problem Analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	<b>Design / development of Solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	<b>The engineer and Society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological Change
<b>Program Specific Outcomes</b>	
PSO 1	<b>Basic Electronic and communications knowledge:</b> Apply basic knowledge related to electronic circuits, VLSI, communication systems, signal processing and embedded systems to solve engineering/societal problems.
PSO 2	<b>Design Methods:</b> Design, verify and authenticate electronic functional elements for different applications, with skills to interpret and communicate results.
PSO 3	<b>Experimentation &amp; Communications:</b> Engineering and management concepts are used to analyze specifications and prototype electronic experiments/projects either independently or in teams.

**Head of the Department**

**SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY**  
(An Autonomous Institution under UGC, New Delhi)

B.Tech. - I Year – I Semester

L T P C  
3 1 0 4

**(R22MTH1111) MATRICES AND CALCULUS**

**Course Objectives:** To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

**Course outcomes:** After learning the contents of this paper the student must be able to

1. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
2. Find the Eigenvalues and Eigen vectors, Reduce the quadratic form to canonical form using orthogonal transformations.
3. Solve the applications on the mean value theorems.
4. Evaluate the improper integrals using Beta and Gamma functions
5. Find the extreme values of functions of two variables with/ without constraints.
6. Evaluate the multiple integrals and apply the concept to find areas, volumes

**UNIT-I: Matrices**

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, LU Decomposition method, Gauss Jacobi's and Gauss Seidel Iteration Method.

**UNIT-II: Eigen values and Eigen vectors**

Linear Transformation and Orthogonal Transformation: Eigenvalues, Eigenvectors and their properties with reference to inverse, Transpose, Symmetric, Skew-Symmetric, Hermetian, Skew-Hermetian, Orthogonal and Unitary matrices, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

**UNIT-III: Calculus**

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series.

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

**UNIT-IV: Multivariable Calculus (Partial Differentiation and applications)**

Definitions of Limit and continuity.

Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Taylor's series for two variables. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

**UNIT-V: Multivariable Calculus (Integration)**

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5<sup>th</sup> Edition, 2016.

**REFERENCE BOOKS:**

1. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.



# SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

Recognized under 2(f) and 12(B) of UGC Act 1956

NBA Accredited, Approved by AICTE and Permanently affiliated to JNTUH

Sheriguda (V), Ibrahimpatnam, R.R.Dist, Hyderabad - 501 510

## Department of Electronics and Communication Engineering

### COURSE OUTCOMES (CO'S):

Course Code & Name: R22MTH1111 & MATRICES AND CALCULUS

Course outcomes:

After learning the contents of this paper the student must be able to,

Course Name	Course Outcomes
C111.1	Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
C111.2	Find the Eigen values and Eigen vectors, Reduce the quadratic form to canonical form using orthogonal transformations
C111.3	Solve the applications on the mean value theorems
C111.4	Evaluate the improper integrals using Beta and Gamma functions
C111.5	Find the extreme values of functions of two variables with/without constraints
C111.6	Evaluate the multiple integrals and apply the concept to find areas, volumes



## SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

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Sheriguda (V), Ibrahimpatnam, R.R.Dist, Hyderabad - 501 510

### Department of Electronics and Communications Engineering

Course Name: MATRICES AND CALCULUS

#### Mapping of Course Outcomes (CO's) with PO's:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C111.1	2	3	3	1	-	-	-	-	-	-	-	2	2	2	2
C111.2	3	2	2	1	-	-	-	-	-	-	-	1	3	2	3
C111.3	1	3	3	2	-	-	-	-	-	-	-	1	2	2	1
C111.4	3	2	1	1	-	-	-	-	-	-	-	1	3	2	3
C111.5	1	2	2	3	-	-	-	-	-	-	-	2	2	2	1
C111.6	3	2	2	2	-	-	-	-	-	-	-	1	3	2	3
C111	2.17	2.33	2.17	1.67	-	-	-	-	-	-	-	1.33	2.5	2	2.17

3- High

2- Medium

1- Low

**Faculty**



SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY  
B. TECH –ELECTRONICS & COMMUNICATION ENGINEERING

Mapping CO with PO/PSO; Course with PO/PSO with Justification

Course Outcome Program Outcomes Mapping using - Competencies-Performance Indicators.										
Subject Code / Name :R22MTH1111 / MATRICES AND CALCULUS										
PO/ CO	Competency	Performance Indicators	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6		
<b>PO1: Engineering Knowledge: apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.</b>	1.1	Demonstrate competence in mathematical modeling	1.1.1	Apply mathematical techniques such as linear algebra, differential calculus, differential equations and integral calculus to solve problems	y	y	y	y	y	y
			1.1.2	Apply concepts of Complex Variable, probability, linear algebra, vector integration and transformation techniques to model and solve electronics engineering problems.	y	y	y	y		y
	1.2	Demonstrate competence in basic sciences	1.2.1	Apply laws of natural science to an engineering problem		y		y	y	y
	1.3	Demonstrate competence in engineering fundamentals	1.3.1	Apply engineering fundamentals	y	y	y	y	y	y
	1.4	Demonstrate competence in specialized	1.4.1	Apply electronics engineering concepts to solve engineering	y	y		y		y

		engineering knowledge to the program		problems						
				Average	2	3	1	3	1	3
				Average Final	2	3	1	3	1	3
<b>PO2: Problem Analysis: identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.</b>	2.1	Demonstrate an ability to identify and formulate complex engineering problem	2.1.1	Articulate problem statements and identify objectives.	y	y	y	Y	y	y
			2.1.2	Identify engineering systems, variables, and parameters to solve a problem	y	y	y	Y	y	y
			2.1.3	Identify the mathematical, engineering and other relevant knowledge that applies to a given problem	y	y	y	Y	y	y
	2.2	Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.1	Reframe complex problems into interconnected sub-problems.	y	y	y	Y	y	y
			2.2.2	Identify, assemble and evaluate information and resources	y	y	y	Y	y	y
			2.2.3	Identify existing solution/methods for solving the problem, including forming justified approximations and assumptions	y	y	y	Y	y	y
			2.2.4	Compare and contrast alternative solution/methods to select the best methods.	y	y	y	Y	y	y
	2.3	Demonstrate an ability to formulate and interpret a model	2.3.1	Combine scientific principles and engineering concepts to formulate model/s (mathematical or otherwise) of a system or process that is appropriate in terms of applicability and required accuracy.	y	y	y	Y	y	y
			2.3.2	Identify assumptions (mathematical and physical) necessary to allow modeling of a system at the level of accuracy required.	y	y	y	Y	y	y
	2.4	Demonstrate an ability to execute a solution process and analyze	2.4.1	Apply engineering mathematics to implement solution	y		y			
			2.4.2	Analyze and interpret the results using contemporary tools.	y		y			

		results	2.4.3	Identify the limitations of the solution and sources/causes of error.	y		y			
			2.4.4	Arrive at conclusions with respect to the objectives.	y		y			
		Average			3	2	3	2	2	2
		Average Final			3	2	3	2	2	2
<b>PO3: Design &amp; Development of Solutions: design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.</b>	3.1	Demonstrate an ability to define a complex/open-ended problem in engineering terms	3.1.1	Recognize that need analysis is key to good problem definition	y	y	y		y	
			3.1.2	Able to identify and document system requirements from stakeholders.	y	y	y		y	y
			3.1.3	Ability to review state of the art literature to synthesize requirements.	y	y	y		y	y
			3.1.4	Extract engineering requirements from relevant engineering codes and standards defined by ISO/IEC/IEEE.	y	y	y		y	y
			3.1.5	Explore and synthesize engineering requirements considering health, safety, risks, environment, cultural and societal issues	y	y	y		y	y
			3.1.6	Determine design, objectives, functional requirements and arrive at specifications	y	y	y		y	y
		y		y	y		y	y		
	3.2	Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1	Ability to explore design alternatives.	y	y	y		y	y
			3.2.2	Build models/prototypes to develop diverse set of design solutions	y	y	y	y	y	y
			3.2.3	Identify suitable criteria for evaluation of alternate design solutions	y	y	y	y	y	y
	3.3	Demonstrate an ability to select optimal design scheme for further development	3.3.1	Ability to perform systematic evaluation of the degree to which several design concepts meet the criteria.	y	y	y	y	y	y
			3.3.2	Consult with domain experts and stakeholders to select candidate engineering design solution for further development	y	y	y	y		
	3.4	Demonstrate an ability to advance an	3.4.1	Refine a conceptual design into a detailed design within the	y		y	y		

	engineering design to defined end state		existing constraints (of the resources)								
		3.4.2	Generate information through appropriate tests to improve or revise design	y		y					
				3	2	3	1	2	2		
				3	2	3	1	2	2		
<b>PO4: Conduct Investigation of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.</b>	4.1	Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.1	Define a problem for purpose of investigation, its scope and importance	y			y	y	y	
			4.1.2	Choose appropriate methods, algorithms, hardware/software tools and techniques of experiment design, system calibration, data acquisition, analysis and presentation	y			y	y	y	
			4.1.3	Apply appropriate hardware/software tools to conduct the experiment				y		y	y
			4.1.4	Establish a relationship between measured data and underlying physical principles	y	y	y	y	y	y	y
	4.2	Demonstrate an ability to design experiments to solve open ended problems	4.2.1	Design and develop experimental approach, specify appropriate equipment and procedures			y	y		y	y
			4.2.2	Understand the importance of statistical design of experiments and choose an appropriate experimental design plan based on the study objectives	y			y	y	y	y
	4.3	Demonstrate an ability to analyze data and reach a valid conclusion	4.3.1	Use appropriate procedures, tools and techniques to collect and analyze data	y	y	y	y	y		
			4.3.2	Critically analyze data for trends and correlations, stating possible errors and limitations				y		y	y
			4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions	y	y	y	y	y		
			4.3.4	Synthesize information and knowledge about the problem from the raw				y		y	

				data to reach appropriate conclusions							
					1	1	2	1	3	2	
					1	1	2	1	3	2	
<b>PO5: Modern Tools Usage: create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.</b>	5.1	Demonstrate an ability to identify/create modern engineering tools, techniques and resources	5.1.1	Identify modern engineering tools techniques and resources for engineering activities							
			5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems							
	5.2	Demonstrate an ability to select and apply discipline specific tools, techniques and resources	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information (ii) modeling and simulating (iii) monitoring system performance, and (iv) creating engineering designs							
			5.2.2	Demonstrate proficiency in using discipline specific tools							
	5.3	Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.1	Discuss limitations and validate tools, techniques and resources							
			5.3.2	Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use.							
						0	0	0	0	0	0
						-	-	-	-	-	-
<b>PO6: The Engineer and Society: apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.</b>	6.1	Demonstrate an ability to describe engineering roles in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1	Identify and describe various engineering roles; particularly as pertains to protection of the public and public interest at global, regional and local level.							
	6.2	Demonstrate an understanding of professional engineering regulations,	6.2.1	Interpret legislation, regulations, codes, and standards relevant to professional engineering practice and explain its contribution to the protection of the public.							

		legislation and standards								
					0	0	0	0	0	0
					-	-	-	-	-	-
<b>PO7: Environment &amp; Sustainability: understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.</b>	7.1	Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts	7.1.1	Identify risks/impacts in the life-cycle of an engineering product or activity						
			7.1.2	Understand the relationship between the technical, socioeconomic and environmental dimensions of sustainability						
	7.2	Demonstrate an ability to apply principles of sustainable design and development	7.2.1	Describe management techniques for sustainable development						
			7.2.2	Apply principles of preventive engineering and sustainable development to an engineering activity or product relevant to the discipline						
					0	0	0	0	0	0
					-	-	-	-	-	-
<b>PO8: Ethics: apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.</b>	8.1	Demonstrate an ability to recognize ethical dilemmas	8.1.1	Identify situations of unethical professional conduct and propose ethical alternatives						
	8.2	Demonstrate an ability to apply the code of ethics	8.2.1	Identify tenets of code of ethics given by the professional bodies like IEEE.						
			8.2.2	Examine and apply moral & ethical principles to known case studies						
					0	0	0	0	0	0
				-	-	-	-	-	-	
<b>PO9: Individual &amp; Team work: function effectively as an individual and as a member or leader in diverse teams, and in</b>	9.1	Demonstrate an ability to form a team and define a role for each member	9.1.1	Recognize a variety of working and learning preferences; appreciate the value of diversity on a team						
			9.1.2	Implement the norms of practice (e.g. rules, roles, charters, agendas etc.) of effective team work, to accomplish a goal						
	9.2	Demonstrate	9.2.1	Demonstrate effective						

<b>multidisciplinary settings.</b>		effective individual and team operations--- communication, problem solving, conflict resolution and leadership skills		communication, problem solving, conflict resolution and leadership skills							
			9.2.2	Treat other team members respectfully							
			9.2.3	Listen to other members							
			9.2.4	Maintain composure in difficult situations							
	9.3	Demonstrate success in a team based project	9.3.1	Present results as a team, with smooth integration of contributions from all individual efforts							
						0	0	0	0	0	0
					-	-	-	-	-	-	
<b>PO10: Communication: communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.</b>	10.1	Demonstrate an ability to comprehend technical literature and document project work	10.1.1	Read, understand and interpret technical and non-technical information							
			10.1.3	Create flow in a document or presentation- a logical progression of ideas so that the main point is clear							
	10.2	Demonstrate competence in listening, speaking and presentation	10.2.1	Listen to and comprehend information, instructions, and viewpoints of others							
			10.2.2	Deliver effective oral presentations to technical and nontechnical audiences							
	10.3	Demonstrate the ability to integrate different modes of communication	10.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations							
			10.3.2	Use a variety of media effectively to convey a message in a document or a presentation							
						0	0	0	0	0	0
						-	-	-	-	-	-
	<b>PO11: Project management &amp; Finance: demonstrate knowledge and understanding of the engineering</b>	11.1	Demonstrate an ability to evaluate the economic and financial performance of an engineering	11.1.1	Describe various economic and financial costs/benefits of an engineering activity						
				11.1.2	Analyze different forms of financial statements to evaluate the financial status of an engineering						

<b>and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.</b>		activity		project							
	11.2	Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1	Analyze and select the most appropriate proposal based on economic and financial considerations							
	11.3	Demonstrate an ability to plan/manage an engineering activity within time and budget constraints	11.3.1	Identify the tasks required to complete an engineering activity and the resources required to complete the tasks							
			11.3.2	Use project management tools to schedule an engineering project so it is completed on time and on budget							
						0	0	0	0	0	0
					-	-	-	-	-	-	
<b>PO12: Life-long Learning: recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.</b>	12.1	Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1	Describe the rationale for requirement for continuing professional development					y		
			12.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap	y				y		
	12.2	Demonstrate an ability to identify changing trends in engineering knowledge and practice	12.2.1	Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current	y					y	
			12.2.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field.	y	y	y	y			y
	12.3	Demonstrate an ability to identify and access sources for new information	12.3.1	Source and comprehend technical literature and other credible sources of information	y	y	y	y	y	y	y
			12.3.2	Analyze sourced technical and popular information for feasibility, viability, sustainability etc.	y						
						2	1	1	1	2	1
					2	1	1	1	2	1	

**SRI INDU COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)  
DEPARTMENT OF HUMANITIES & SCIENCES**

**DEPARTMENT CALENDAR – 2022-2023 (I B.Tech – II SEMESTER)**

DAYS	APRIL - 23			MAY-2023			JULY-2023			AUGUST-2023			SEPTEMBER-2023	
SATURDAY	1						1							
SUNDAY	2						2							
MONDAY	3	COMMENCEMENT OF II SEM CLASS WORK	1				3							
TUESDAY	4		2				4			1				
WEDNESDAY	5	BABU JAGJIVAN RAM B'DAY	3				JUNE-2023 5			2				
THURSDAY	6		4		1		6			3				
FRIDAY	7	GOOD FRIDAY	5		2		7			4			1	
SATURDAY	8		6		3		8			5			2	II SEMESTER END EXAMINATIONS
SUNDAY	9	HOLIDAY	7	HOLIDAY	4	HOLIDAY	9	HOLIDAY	6	HOLIDAY	3	HOLIDAY		
MONDAY	10		8		5		10			7			4	
TUESDAY	11		9		6		11			8			5	
WEDNESDAY	12		10		7		12			9			6	
THURSDAY	13		11		8		13			10			7	II SEMESTER END EXAMINATIONS
FRIDAY	14	AMBEDKAR B'DAY	12		9		14			11			8	
SATURDAY	15		13	SUMMER VACATION	10		15			12			9	
SUNDAY	16	HOLIDAY	14		11	HOLIDAY	16	HOLIDAY	13	PREPARATION & LAB END EXAMINATIONS	10	HOLIDAY		
MONDAY	17		15		12	MID I EXAM	17		14	MID II EXAM	11			
TUESDAY	18		16		13	MID I EXAM	18		15	INDEPENDENCE DAY	12			
WEDNESDAY	19		17		14	MID I EXAM	19		16	MID II EXAM	13			
THURSDAY	20		18		15	MID I EXAM	20		17	MID II EXAM	14			
FRIDAY	21		19		16	MID I EXAM	21		18	MID II EXAM	15			
SATURDAY	22	RAMZAN	20		17	MID I EXAM	22		19	MID II EXAM	16			
SUNDAY	23	HOLIDAY	21		18	HOLIDAY	23	HOLIDAY	20	HOLIDAY	17	HOLIDAY		
MONDAY	24		22		19		24		21		18			
TUESDAY	25		23	20		25		22		19				
WEDNESDAY	26		24	21		26		23		20				
THURSDAY	27		25	22		27		24		21				
FRIDAY	28		26	23	I MID MARKS SUBMISSION	28		25		22				
SATURDAY	29		27	24		29	MOHRAM	26	II MID MARKS SUBMISSION	23				
SUNDAY	30	HOLIDAY	28	HOLIDAY	25	HOLIDAY	30	HOLIDAY	27	HOLIDAY	24	HOLIDAY		
MONDAY	29		29		26		31			25				
TUESDAY	30		30		27					26				
WEDNESDAY			31		28					27	II SEMESTER END EXAMINATIONS			
THURSDAY					29	BAKRID				28				
FRIDAY					30					29				
SATURDAY										30				



Sri Indu College of Engineering & Technology :: Sheriguda (V), R.R.Dist  
Department of Humanities & Sciences

I B.Tech I Semester ECE-A – TIME TABLE 2022-23

ROOM NO: F-101

w.e.f: 10-11-2022

Time/Day	9:40am-10:30am I	10:30-11:20am II	11:20-12:10pm III	L U N C H	12:40-01:45pm IV	1:45-2:50pm V	2:50-4:00pm VI
MON	M&C	ESE	CPE		← CPE LAB →		
TUE	← Elements of ECE →				M&C	CPE	AP
WED	← EWS →				M&C	CPE	AP
THU	ESE	CPE	AP		← AP LAB →		
FRI	M&C	AP	EWS		ESE	CPE	COUNS
SAT	← ELCS LAB →				ESE	AP	M&C

COURSE CODE	COURSE NAME	FACULTY NAME
M&C	Matrices And Calculus	M Leela
AP	Applied Physics	S Ramesh Kumar
CPE	C Programming for Engineers	D Mounika
EWS	Engineering Workshop	Santosh
ESE	English for Skill Enhancement	Dr KP Kumaran
Elements of ECE	Elements of Electronics and Communication Engineering	Dr NC Sendhil Kumar
AP LAB	Applied Physics Laboratory	S Ramesh Kumar
ELCS LAB	English Language and Communication Skills Laboratory	Dr KP Kumaran
CPE LAB	C Programming for Engineers Laboratory	D Mounika
COUNS	Counseling	

CLASS COORDINATOR: Ch Ashok Kumar

TIME TABLE INCHARGE: M Leela

  
Head of the Department

  
Principal



**Sri Indu College of Engineering & Technology :: Sheriguda (V), R.R.Dist**  
**Department of Humanities & Sciences**

**I B.Tech I Semester ECE-B - TIME TABLE 2022-23**

ROOM NO: F-102

w.e.f: 10-11-2022

Time/Day	9:40am-10:30am I	10:30-11:20am II	11:20-12:10pm III	L U N C H	12:40-01:45pm IV	1:45-2:50pm V	2:50-4:00pm VI
MON	AP	M&C	CPE		← CPE LAB →		
TUE	← AP LAB →				AP	CPE	ESE
WED	EWS	COUNS	AP		ESE	CPE	M&C
THU	M&C	CPE	AP		← EWS →		
FRI	← Elements of CE →				ESE	CPE	M&C
SAT	M&C	ESE	AP		← ELCS LAB →		

COURSE CODE	COURSE NAME	FACULTY NAME
M&C	Matrices And Calculus	M Leela
AP	Applied Physics	Ashok Kumar Ch
CPE	C Programming for Engineers	Dr P Ramesh Kumar
EWS	Engineering Workshop	Santosh
ESE	English for Skill Enhancement	SRG Shalini
Elements of ECE	Elements of Electronics and Communication Engineering	Dr NC Sendhil Kumar
AP LAB	Applied Physics Laboratory	Ashok Kumar Ch
ELCS LAB	English Language and Communication Skills Laboratory	SRG Shalini
CPE LAB	C Programming for Engineers Laboratory	Dr P Ramesh Kumar
COUNS	Counseling	
CLASS COORDINATOR: Ch Ashok Kumar		TIME TABLE INCHARGE: M Leela

*ASH*  
Head of the Department

*Santosh*  
Principal

	<b>SRI INDU COLLEGE OF ENGG &amp; TECH</b> (Regulation :BR22) Department of Electronics and Communications Engineering		Rev1: Pages : 4	
	Sub. Code & Title	R22MTH1111 & MATRICES AND CALCULUS		
	Academic Year: 2022-23		Year/Sem./Section	I/I ECE
	Faculty Name & Designation		M.Leela & Assoc.Prof.	

Department of HUMANITIES & SCIENCES

INDIVIDUAL TIME TABLE

NAME OF THE FACULTY		M LEELA		SUBJECT		MATRICES AND CALCULUS	
TIME	09:40am To 10:40am	10:40am To 11:40am	11:40am To 12:40pm		1:30pm To 2:20pm	2:20pm To 3:10pm	3:10pm To 4:00pm
DAY	1	2	3		4	5	6
MON	ECE-A	ECE-B		L U N C H			
TUE		CSIT			ECE-A		
WED	CSIT	ECE-B	ECE-B		ECE-A	CSIT	
THU	ECE-B						
FRI	CSIT				ECE-B(T)		ECE-A(T)
SAT						CSIT(T)	ECE-A

HOD

PRINCIPAL

	<b>SRI INDU COLLEGE OF ENGG &amp; TECH</b> (Regulation :BR22) Department of Electronics and Communications Engineering		Rev1: Pages :
	Sub. Code & Title	R22MTH1111 & MATRICES AND CALCULUS	
	Academic Year: 2022-23	Year/Sem./Section	I/ ECE
	Faculty Name & Designation	M.Leela & Assoc.Prof.	

### STUDENTS LIST OF ECE (2022-2023)

S.No	Hall Ticket No	Name of the Candidate
1	22D41A0401	A LIKHITHA
2	22D41A0402	ABBANAGONI TRISHA
3	22D41A0403	ACIREDDY SNEHALATHA
4	22D41A0404	AEMME SURYA PRAKASH
5	22D41A0405	AKA SANVITHA
6	22D41A0406	ALUGUBELLI SRAVAN KUMAR REDDY
7	22D41A0407	AMARAGONDA VIJAY
8	22D41A0408	AMBADI SHIVAMANI
9	22D41A0409	AMME RAJESH
10	22D41A0410	ANANYA BALLALA
11	22D41A0411	ARKA SUNNY BHARGAV
12	22D41A0412	BANOTH GOPICHAND NAYAK
13	22D41A0413	BANOTH THARUN KUMAR
14	22D41A0414	BINGI SRUTHI
15	22D41A0415	BODA HARIKA
16	22D41A0416	BODDU BHAVITHA
17	22D41A0417	BODDUPALLY SPOORTHI
18	22D41A0418	BODOLLA SANDEEP

19	22D41A0419	BOMMA PRANAVI
20	22D41A0420	BOPPA SHARVAN
21	22D41A0421	BOTTE ANIL
22	22D41A0422	CHAKALI VAMSHI
23	22D41A0423	CHANDANAPU CHANDRA VIKAS
24	22D41A0424	CHELIMANDLA ARAVIND KUMAR
25	22D41A0425	DAMMOJU HARSHITHA
26	22D41A0426	DEVIREDDY HARATHI
27	22D41A0427	DHANAVATH MANJULA
28	22D41A0428	DUMPETA VENKATESH
29	22D41A0429	ERAMALLA VIKRANTH GOUD
30	22D41A0430	G ANJALI
31	22D41A0431	G B SHIVA SAI KRISHNA
32	22D41A0432	GADDAM SRIRAM
33	22D41A0433	GANJI MANOJ KUMAR
34	22D41A0434	GANJI SAI TEJA
35	22D41A0435	GANNEBOINA AADITYA
36	22D41A0436	GOTTIPATI VENKATESWARLU
37	22D41A0437	GUJJETI GANESH KARTHIKEYA
38	22D41A0438	JATAVATH MUNI
39	22D41A0439	JURRU SURESH
40	22D41A0440	K SATHISH KUMAR
41	22D41A0441	KADEM MAITHILI
42	22D41A0442	KAMBALAPALLY MANIKANTA REDDY
43	22D41A0443	KAMSANI NISHITHA
44	22D41A0444	KANCHARLA NANDITHA

45	22D41A0445	KANDURI AKSHAYA REDDY
46	22D41A0446	KANUKULA VAMSHI
47	22D41A0447	KANUKULA VARDHAN
48	22D41A0448	KARANGULA ROSHINI
49	22D41A0449	KARNATI TEJASWINI
50	22D41A0450	KATAM RAKESH
51	22D41A0451	KATHERAPAKA SNEHA
52	22D41A0452	KETHAVATH MOUNIKA
53	22D41A0453	KOMMU SHIVANI
54	22D41A0454	KONGARA RITHIKA
55	22D41A0455	KOPPU RAMYASRI
56	22D41A0456	KOPPULA SHIVA KUMAR
57	22D41A0457	KORRA PAVAN KUMAR
58	22D41A0458	KOTAPATI SRINIVASULU
59	22D41A0459	KOTHAGOLLA MANASA
60	22D41A0460	KOTHAKAPU JAI ADITYA REDDY
61	22D41A0461	KUNDARAPU BHANU PRASANNA
62	22D41A0462	LADE SOWJANYA
63	22D41A0463	LAXMI NAARASIMHA
64	22D41A0464	MADDI MANISHA
65	22D41A0465	MADHAGONI RUTHIKA GOUD
66	22D41A0466	MADHAGOUNI DIVYA
67	22D41A0467	MALLREDDY ANANYA
68	22D41A0468	MANCHIRYALA MANASWINI
69	22D41A0469	MAREDDY NAVEEN REDDY
70	22D41A0470	MAROJU PRAVALIKA

71	22D41A0471	MOHAMMED MATEEN
72	22D41A0472	MOHD ABDUL RIYAN
73	22D41A0473	MUDDAM SAI KOUSHIK
74	22D41A0474	MUNUGAPATI SRILAKSHMI
75	22D41A0475	NAGILLA SRAVANI
76	22D41A0476	NAGULA KEERTHI
77	22D41A0477	NALLA RANJITH REDDY
78	22D41A0478	NALLA SIDDARDHA REDDY
79	22D41A0479	NALLA USHASRI
80	22D41A0480	NALLAVELLI KALYAN BABU
81	22D41A0481	NARLAGIRI JAGADEESHWAR
82	22D41A0482	NENAVATH PRIYANKA
83	22D41A0483	OGGU AYODHYA
84	22D41A0484	PAJJURI HARSHITHA
85	22D41A0485	PALLEPATI SAI SHIVA DIKSHITH
86	22D41A0486	PANDI HARSHITHA
87	22D41A0487	PANUGANTI BHARATH
88	22D41A0488	PASUPULA SINDHUJA
89	22D41A0489	PATHULOTHU KRISHNA
90	22D41A0490	PEDDAVENA ANVESH
91	22D41A0491	PEDDI ANJALI
92	22D41A0492	PITTALA NANDINI
93	22D41A0493	POVAKU SHIVANI
94	22D41A0494	PURUSHOTHAM SATHWIK
95	22D41A0495	PUTCHAKAYALA MALLIKARJUNA RAO
96	22D41A0496	PUTTA KAVERI

97	22D41A0497	RAGANAMONI SHIVA SHANKER
98	22D41A0498	RAMADAS HARSHMITHA
99	22D41A0499	RAMAVATH NAVEENA
100	22D41A04A0	RAMAVATH RAGHAVENDRA
101	22D41A04A1	RAYAPU SUDHEER REDDY
102	22D41A04A2	SAIPREETAM VINNAKOTA
103	22D41A04A3	SANDHYA JUPALLY
104	22D41A04A4	SANUVALA KARTHIK
105	22D41A04A5	SAYNI NITHIN KUMAR
106	22D41A04A6	SEELAM SIVA NAGA LAKSHMI
107	22D41A04A7	SHAIK ABID
108	22D41A04A8	SURAM SRIJA
109	22D41A04A9	SURAPALLY NANDINI
110	22D41A04B0	TANGALAPALLY NARSAIAH
111	22D41A04B1	TENAGA SAI HANSIKA
112	22D41A04B2	THAMMISHETTY SHREEJA
113	22D41A04B3	THANGALLAPALLY AKHILA
114	22D41A04B4	THOKALA SAI CHANDANA
115	22D41A04B5	THOTAPALLI SAI SUBRAMANYAM
116	22D41A04B6	TIRUGAMALLA MUKESH KUMAR
117	22D41A04B7	TOTAPALLI SUSHMA
118	22D41A04B8	TURPU SREEJA
119	22D41A04B9	UDUTHALA RAVI GOUD
120	22D41A04C0	VADDEGONI NAGARAJU
121	22D41A04C1	VADLAMUDI VIJAY KUMAR
122	22D41A04C2	VADLAMUDI YASWANTH

123	22D41A04C3	VALIJALA MAHENDER
124	22D41A04C4	VANAPOSA KRANTHI KUMAR
125	22D41A04C5	VEGINATI RAVI KUMAR
126	22D41A04C6	VEMIREDDY VENKATA SAHITHI
127	22D41A04C7	YADALA SAI
128	22D41A04C8	YERRABOIENA VASANTH KUMAR
129	22D41A04C9	PATI SHIVA KUMAR REDDY
130	21D41A0467	D PAVAN KUMAR
131	21D41A04G2	MOHD ZAMEER

**FACULTY INCHARGE**

	<b>SRI INDU COLLEGE OF ENGG &amp; TECH</b> <b>LESSON PLAN</b> <b>(Regulation :BR22)</b> <b>Department of Electronics and Communications Engineering</b>			<b>Rev1:</b> <b>Pages :</b>
	<b>Sub. Code &amp; Title</b>	R22MTH111 & MATRICES AND CALCULUS		
	<b>Academic Year: 2022-23</b>	<b>Year/Sem./Section</b>	I/I ECE	
	<b>Faculty Name &amp; Designation</b>	M.Leela & Assoc.Prof.		

Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT	
			From	To					
	L1. Remembering L2. Understanding L3. Applying L4. Analyzing L5. Evaluating L6. Creating								
<b>UNIT – I</b>									
<b>I</b>	<b>Matrices</b>					<b>13</b>			
1.1	Introduction of matrices	T2	465	465	Black board	02		CO1/L1	
1.2	Definitions on Real matrices and their problems	T2	465	481	Black board	01		CO1/L2	
1.3	Definitions on Complex matrices and their problems	T2	599	605	Black board	01		CO1/L2	
1.5	Echelon form	R3	34	35	Black board	01		CO1/L5	
1.6	Normal form	R3	46	46	Black board	01		CO1/L3	
1.7	Gauss-Jordan method (To find the inverse of a matrix)	R3	76	78	Black board	01		CO1/L3	
1.8	System of Homogeneous linear equations	R3	84	84	Black board	01		CO1/L2	
1.9	System of Non-Homogeneous linear equations	R3	84	85	Black board	02		CO1/L2	
1.10	Gauss elimination method	R3	136	137	Black board	01		CO1/L5	
1.11	Gauss Jacobi's Iteration Method	R3	138	140	Black board	01		CO1/L5	
1.11	Gauss Seidel Iteration Method	R3	141	142	Black board	01		CO1/L5	
1.12	LU Decomposition method				Black board	01		CO1/L6	
	<b>Signature of the HOD/Coordinator</b>								
Unit/ Item No.		Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT	

UNIT-II								
II	Eigen values and Eigen vectors					16		
2.1	Introduction of Linear Transformation and Orthogonal Transformation	T2	540	541	Black board	01		CO2/L2
2.2	Properties of Eigen values and Eigen vectors on Real matrices	T2	541	542	Black board	01		CO2/L2
2.3	Problems of Eigen values and Eigenvectors on Real matrices	T2	543	548	Black board	01		CO2/L5
2.4	Properties of Eigen values and Eigen vectors on Complex matrices	T2,W9	550	561	Black board	01		CO/L3
2.5	Problems of Eigen values and Eigenvectors on complex matrices	T2,W10	563	567	Black board	01		CO2/L5
2.6	Diagonalization by similarity transformation	T2	569	570	Black board	02		CO2/L1
2.7	Diagonalization by orthogonal transformation	R2	438	441	Black board	02		CO2/L1
2.8	Cayley-Hamilton Theorem	R2	430	431	Black board	01		CO2/L2
2.9	Inverse and power of a matrix by Cayley-Hamilton Theorem	R2	431	434	Black board	01		CO2/L3
2.10	Introduction of Quadratic forms	R2	435	438	Black board	01		CO2/L2
2.11	Reduction of Quadratic form to canonical forms by Linear Transformation	R2	441	443	Black board	02		CO2/L3
2.12	Reduction of Quadratic form to canonical forms by Orthogonal Transformation	R2	438	441	Black board	02		CO2/L3
		<b>Signature of the HOD/Coordinator</b>						

UNIT-III								
III	Calculus					15		
3.1	Rolle's theorem	R3	330	331	Black board, PPT	01		CO4/L3
3.2	Lagrange's Mean value theorem	R3	339	340	Black board ,PPT	02		CO4/L3
3.3	Cauchy's Mean value Theorem	R3	353	354	Black board, PPT	01		CO4/L3
3.4	Taylor's Series	R3	358	359	Black board	01		CO4/L5
3.5	Revolution of curves to evaluate surface areas and volumes (only in Cartesian coordinates)	W11			Black board	02		CO5/L5
3.6	Forms of Beta functions	R3	462	465	Black board	02		CO5/L2

3.7	Problems on Beta functions	R3	465	472	Black board	02		CO5/L5	
3.8	Relationship between Gamma and Beta functions	R3	474	475	Black board	01		CO5/L4	
3.9	Problems on Gamma functions	R3	478	483	Black board	01		CO5/L5	
3.10	Problems on Gamma and Beta functions	R3	496	514	Black board	02		CO5/L5	
		<b>Signature of the HOD/Coordinator</b>							
<b>UNIT-IV</b>									
<b>IV</b>	<b>Multivariable calculus (Partial Differentiation and applications)</b>						<b>11</b>		
4.1	Definitions and problems of Limit and continuity	T2	365	368	Black board	01		CO6/L2	
4.2	Problems on Partial Differentiation	R3	377	387	Black board	01		CO6/L5	
4.3	Euler's Theorem	R3	388	390	Black board	01		CO6/L3	
4.4	Total derivative	R3	398	394	Black board	01		CO6/L5	
4.5	Jacobian functions	R3	395	403	Black board	01		CO6/L5	
4.6	Functional dependence	R3	404	408	Black board	01		CO6/L3	
4.7	Maxima and minima of functions of two variables	R3	416	417	,PPT	02		CO6/L5	
4.8	Maxima and minima of functions of three variables by using method of Lagrange multipliers.	R3	439	439	Black board	03		CO6/L5	
		<b>Signature of the HOD/Coordinator</b>							
<b>UNIT-V</b>									
<b>V</b>	<b>MultivariableCalculus(Integration)</b>						<b>12</b>		
5.1	Evaluation of Double Integrals in Cartesian form	T2	285	304	Black board	01		CO3/L2	
5.2	Evaluation of Double Integrals in polar coordinates	T2	305	313	Black board	02		CO3/L2	
5.3	Change of order of integration (only Cartesian form)	T1	324	343	Black board	01		CO3/L3	
5.4	Evaluation of Triple Integrals	T1	349	363	Black board	01		CO3/L2	
5.5	Change of variables (Cartesian to polar) for double integrals	T1	313	322	Black board	01		CO3/L3	
5.6	Change of variables (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.	T1	397	402	Black board	01		CO3/L3	
5.7	Applications: Areas (by double integrals)	T2	365	382	Black board	02		CO3/L5	
5.8	Applications: volumes (by double integrals and triple integrals)	T2	383	396	Black board	01		CO3/L5	

	<b>SRI INDU COLLEGE OF ENGG &amp; TECH</b> (Regulation :BR22) Department of Electronics and Communications Engineering		Rev1: Pages :
	Sub. Code & Title	R22MTH1111 & MATRICES AND CALCULUS	
	Academic Year: 2022-23	Year/Sem./Section	I/ ECE
	Faculty Name & Designation	M.Leela & Assoc.Prof.	

## LEARNING RESOURCES:

### 1. TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5<sup>th</sup> Edition, 2016.

### 2. REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

### 3. Web Resources:

This course uses exclusively for providing electronic resource, such as lecturer notes, assignment papers, and sample solutions. Students should make appropriate use of this resource

[https://en.wikipedia.org/wiki/Matrix\\_\(mathematics\)](https://en.wikipedia.org/wiki/Matrix_(mathematics))

[https://en.wikipedia.org/wiki/Eigenvalues\\_and\\_eigenvectors](https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors)

[https://en.wikipedia.org/wiki/Mean\\_value\\_theorem](https://en.wikipedia.org/wiki/Mean_value_theorem)

[https://en.wikipedia.org/wiki/Beta\\_function](https://en.wikipedia.org/wiki/Beta_function)

[https://en.wikipedia.org/wiki/Gamma\\_function](https://en.wikipedia.org/wiki/Gamma_function)

<https://study.com/academy/lesson/partial-differentiation-definition-rules-application.html>

[www.nptel.in](http://www.nptel.in)

**4. Mathematics Websites:** The following information on the Mathematics Web sites will be an additional source of information for references and historical development of the Mathematics. Some biographies of outstanding mathematicians are also available.

1. <http://scienceworld.wolfram.com/biography/topics/Mathematicians.html>

2. <http://teachers.sduhsd.k12.ca.us/abrown/index2.html>

3. <http://www.maths.tcd.ie/pub/HistMath/People/RBallHist.html> Mathematicians of the 17<sup>th</sup> and 18<sup>th</sup> Centuries

4. <http://www.geometry.net/math.html> A Geometry Site
5. [http://www-history.mcs.st-andrews.ac.uk/history/Indexes/Full\\_Alph.html](http://www-history.mcs.st-andrews.ac.uk/history/Indexes/Full_Alph.html)  
Site of Biographies of Mathematicians
6. <http://mathforum.org>  
This site includes resources in mathematics for school students, teachers, parents. Also contains some research related material on mathematics teaching and learning. The 'Problems of the Week' contains problems at different levels of mathematics. It includes selected alternative solutions posted by problem solvers which is really nice. The 'Ask Dr. Math' gives useful explanations of math concepts and the discussion groups are about teaching methods.
7. <http://www.cut-the-knot.org>  
Contains interesting puzzles, problems, theorems, proofs, etc. Also has links to other good sites (including all those listed below).
8. <http://nrich.maths.org>  
The site is run by the University of Cambridge. It contains problems for different age groups (5 to 18) that one can post solutions to. Selected solutions are published at the website. One can also post questions. There is an archive of questions posted earlier with answers (in blue coloured font). There are also articles, features, etc.
9. <http://archives.math.utk.edu/>  
A fairly comprehensive archive: contains teaching materials, public domain software, shareware, books, articles, etc.
10. <http://www-groups.dcs.st-and.ac.uk/~history/>  
The MacTutor history of mathematics archive. The best known website for historical information about mathematicians and mathematics.
11. <http://www.maa.org/>  
This is the website of the Mathematical Association of America. Contains useful resources for college mathematics teachers including book reviews.
12. <http://e-math.ams.org/>  
Website of the main professional organization in mathematics: American Mathematical Society. The journal 'Notices of the AMS' is online. Plus Interesting essays.

## 5. Recommended Resources:

1. Adrian Banner. *The Calculus Lifesaver*, Princeton University Press, Princeton, USA, 2007.
2. Alan Jeffrey. *Advanced Engineering Mathematics*, Harcourt/Academic Press, New York, 2002.
3. Hyghes-Hallett, Gleason, McCallum et al. *Single Variable Calculus* (6th Edn) John Wiley and Sons New York, 2013.
4. Hyghes-Hallett, Gleason, McCallum et al. *Multivariable Variable Calculus* (6th Edn) John Wiley and Sons New York, 2013.
5. Peter O' Neil, *Advanced Engineering Mathematics*, Cengage Learning, Boston, USA, 2012.
6. K.A.Stroud and D.J.Booth. *Advanced Engineering Mathematics* (4th Edn) Palgrave/MacMillan, USA. 2003

**Faculty Signature**

	<b>SRI INDU COLLEGE OF ENGG &amp; TECH</b> (Regulation :BR22) Department of Electronics and Communications Engineering		<b>Rev1:</b> <b>Pages : 4</b>
	<b>Sub. Code &amp; Title</b>	R22MTH1111 & MATRICES AND CALCULUS	
	<b>Academic Year: 2022-23</b>	<b>Year/Sem./Section</b>	I/I ECE
	<b>Faculty Name &amp; Designation</b>	M.Leela & Assoc.Prof.	

**LECTURE NOTES**

	<b>SRI INDU COLLEGE OF ENGG &amp; TECH</b> (Regulation :BR22) Department of Electronics and Communications Engineering		Rev1: Pages : 4
	Sub. Code & Title	R22MTH1111 & MATRICES AND CALCULUS	
	Academic Year: 2022-23	Year/Sem./Section	I/I ECE
	Faculty Name & Designation	M.Leela & Assoc.Prof.	

### Topic-wise Link of Video Lectures

Unit 1	Matrices	<a href="https://nptel.ac.in/courses/111/107/111107112/">https://nptel.ac.in/courses/111/107/111107112/</a>
Unit 2	Eigen values and Eigen vectorS	<a href="https://nptel.ac.in/courses/111106051">https://nptel.ac.in/courses/111106051</a>
Unit 3	Calculus	<a href="https://nptel.ac.in/courses/111105121">https://nptel.ac.in/courses/111105121</a>
Unit 4	Multivariable calculus (Partial Differentiation and applications)	<a href="https://nptel.ac.in/courses/111107111">https://nptel.ac.in/courses/111107111</a>
Unit 5	Multivariable Calculus	<a href="https://nptel.ac.in/courses/111/107/111107108/">https://nptel.ac.in/courses/111/107/111107108/</a>



(For ALL Branches)

Duration: 2 Hrs

Dt: 30-12-2022, Day-1 (FN)

Max Marks: 30M

PART – A

Answer All multiple choice questions.

Marks: 10Qx1/2M = 5M

\* (L1-Remembering, L2-Understanding, L3-Appling, L4-Analyzing, L5-Evaluating, and L6-Creating.)

Blooms Taxonomy Levels	Course Outcomes
------------------------------	--------------------

- |  |     |     |
|--|-----|-----|
| 1. Select the rank of $A^T$ when the rank of $A$ is 2. [ ]<br>A) 0    B) 1    C) 2    D) 4.  | I   | CO1 |
| 2. If a square matrix $A$ satisfies $A^T A = A A^T = I$ , then the matrix $A$ is said to be. [ ]<br>A) Symmetric    B) Hermitian    C) Orthogonal    D) None of the above.   | III | CO1 |
| 3. If $I$ is a unit matrix of order $n$ then, $ I $ is. [ ]<br>A) 0    B) 1    C) -1    D) None of the above.  | IV  | CO1 |
| 4. Determine the value of ' $k$ ' such that the rank of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & k & 7 \\ 3 & 6 & 10 \end{bmatrix}$ is 2. [ ]<br>A) 2    B) 3    C) 4    D) 1.  | V   | CO1 |
| 5. The Eigen values of Skew – Hermitian matrix are all. [ ]<br>A) Real    B) Either real or purely imaginary<br>C) Either zero or purely imaginary    D) None.   | I   | CO2 |
| 6. The characteristic equation of the matrix $\begin{bmatrix} 1 & 1 \\ 2 & 5 \end{bmatrix}$ is. [ ]<br>A) $\lambda^2 - 6\lambda + 3 = 0$ B) $\lambda^2 + 6\lambda + 3 = 0$<br>C) $\lambda^2 - 3\lambda + 6 = 0$ D) $\lambda^2 + 6\lambda - 3 = 0$ .  | II  | CO2 |
| 7. The sum and product of the Eigen value of $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 3 & 0 \\ 1 & 0 & 2 \end{bmatrix}$ are. [ ]<br>A) 6, 6    B) 7, 9    C) 5, 4    D) 6, 0.   | III | CO2 |
| 8. If the Eigen values of $A$ are 0, 1, 2. Then the nature of the quadratic form is. [ ]<br>A) Positive definite    B) Positive semi definite<br>C) Negative definite    D) Indefinite.  | IV  | CO2 |
| 9. Select the appropriate name of the expansion,<br>$f(a + h) = f(a) + hf'(a) + \frac{h^2}{2!} f''(a) + \dots + \frac{h^n}{n!} f^n(a + \theta h)$ is. [ ]<br>A) Taylor's theorem with Lagrange's form of Remainder.<br>B) Cauchy's theorem with Lagrange's form of Remainder.<br>C) Raman's theorem with Lagrange's form of Remainder.<br>D) Lagrange's theorem with Lagrange's form of Remainder. | I   | CO3 |
| 10. Identify the value of 'c' using Rolle's theorem in (-1, 1) for $f(x) = x^3 - x$ . [ ]<br>A) 0    B) $\pm \frac{1}{\sqrt{3}}$ C) $\frac{1}{2}$ D) $\pm \frac{1}{\sqrt{2}}$ .  | III | CO3 |

**Answer All fill in the blank questions.**

**Marks: 6Qx1/2M = 3M**

11. Define the condition for Orthogonal matrix, \_\_\_\_\_ . I CO1
12. Gauss-Jacobi's iteration method is also known as, \_\_\_\_\_ . II CO1
13. Organize the equations,  $-y + 2z = 1$ ,  $2x - y = 7$  and  $-x + 2y - z = 1$  are in the way of diagonally dominant system, \_\_\_\_\_ . III CO1
14. The condition for spectral matrix is, \_\_\_\_\_ . I CO2
15. Construct the symmetric matrix corresponding to the quadratic form,  $x^2 + 6xy + 5y^2$  is, \_\_\_\_\_ . III CO2
16. Develop Maclaurin's series expansion of a function  $f(x)$  is, \_\_\_\_\_ . III CO3

**Answer All Match the following questions.**

**Marks: 2Qx1M = 2M**

17. For a homogeneous system of equations( $AX=0$ ), select the appropriate conditions: I CO1

I	II
a) $r < n$	i) Trivial solutions
b) $r \neq n$	ii) Non-trivial solutions
c) $r = n$	

18. Match the correct characteristic equations of the following matrices: I CO2

I	II
a) $\begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$	i) $\lambda^2 - 2\lambda - 35 = 0$
b) $\begin{bmatrix} 2 & 1 \\ 4 & 5 \end{bmatrix}$	ii) $\lambda^2 - 3\lambda - 10 = 0$
c) $\begin{bmatrix} 4 & 3 \\ 9 & -2 \end{bmatrix}$	iii) $\lambda^2 - 7\lambda + 6 = 0$
	iv) $\lambda^2 - \lambda + 18 = 0$

**PART - B**

**Answer any FOUR questions.**

**Marks: 4Qx5M = 20M**

19. Find the inverse of the matrix,  $\begin{bmatrix} -1 & -3 & 3 & -1 \\ 1 & 1 & -1 & 0 \\ 2 & -5 & 2 & -3 \\ -1 & 1 & 0 & 1 \end{bmatrix}$  by using elementary operations (Gauss -Jordan method). I CO1
20. Analyze, the solution to the system of equations using LU Decomposition method (or) factorization method,  $x + y + z = 1$ ,  $3x + y - 3z = 5$  and  $x - 2y - 5z = 10$ . IV CO1
21. Discuss for what value of  $\lambda, \mu$  simultaneous equations,  $x + y + z = 6$ ,  $x + 2y + 3z = 10$  and  $x + 2y + \lambda z = \mu$  will have: VI CO1
  - a) No solution,
  - b) A unique solution,
  - c) An infinite number of solutions.
22. Illustrate the eigen values and the corresponding Eigen vector of the Hermitian matrix,  $\begin{bmatrix} 2 & 3 + 4i \\ 3 - 4i & 2 \end{bmatrix}$ . II CO2
23. Choose orthogonal transformation to reduce the quadratic form,  $3x^2 + 2y^2 + 3z^2 - 2xy - 2yz$  to the normal form. V CO2
24. Interpret the applicability of Cauchy 's mean value theorem for the functions,  $f(x) = e^x$  and  $g(x) = e^{-x}$  in  $[2, 6]$ . II CO3

\*\*\*\*\*



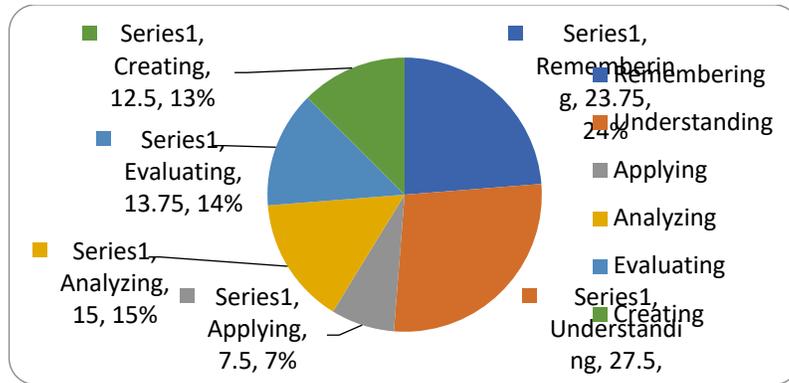
Sri Indu College of Engineering & Technology :: Sheriguda (V), R.R.Dist

Department of Electronics & Communication Engineering

CO & BT Mapping for IB.TECH I MID Examinations

Q no.	Marks	Percentage (%)	Course outcome mapping	Bloom's Taxonomy level mapping
1	0.5	1.25	C111.1	Remembering
2	0.5	1.25	C111.1	Applying
3	0.5	1.25	C111.1	Analyzing
4	0.5	1.25	C111.1	Evaluating
5	0.5	1.25	C111.2	Remembering
6	0.5	1.25	C111.2	Understanding
7	0.5	1.25	C111.2	Applying
8	0.5	1.25	C111.2	Analyzing
9	0.5	1.25	C111.3	Remembering
10	0.5	1.25	C111.3	Applying
11	0.5	1.25	C111.1	Remembering
12	0.5	1.25	C111.1	Understanding
13	0.5	1.25	C111.1	Applying
14	0.5	1.25	C111.2	Remembering
15	0.5	1.25	C111.2	Applying
16	0.5	1.25	C111.3	Applying
17	1	2.5	C111.1	Remembering
18	1	2.5	C111.2	Remembering
19	5	12.5	C111.1	Remembering
20	5	12.5	C111.1	Analyzing
21	5	12.5	C111.1	Creating
22	5	12.5	C111.2	Understanding
23	5	12.5	C111.2	Evaluating
24	5	12.5	C111.3	Understanding

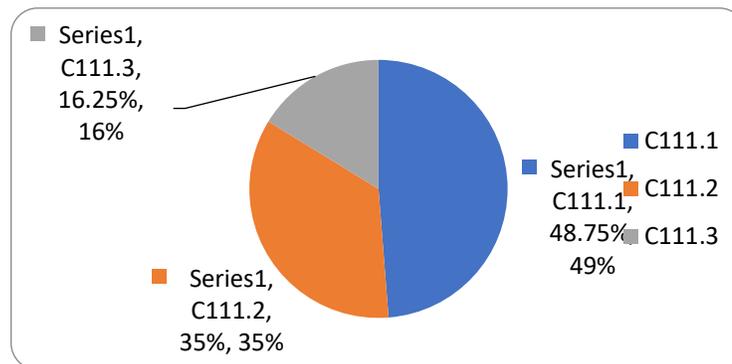
**CO & BT Bloom's Taxonomy level mapping for MID 1**



**UNIT WISE MARKS GIVEN IN MID-1 EXAM**

CO	MARKS	PERCENTAGE
C111.1	19.5	48.75
C111.2	14	35
C111.3	6.5	16.25

**CO & BT Bloom's Taxonomy level mapping for MID 1**



PART – AAnswer All multiple choice questions.

Marks: 10Qx1/2M = 5M

\* (L1-Remembering, L2-Understanding, L3-Appling, L4-Analyzing, L5-Evaluating, and L6-Creating.)

Blooms Taxonomy Levels	Course Outcomes
I	CO4
II	CO4
I	CO5
II	CO5
III	CO5
IV	CO5
I	CO6
II	CO6
III	CO6
IV	CO6

- What is the value of  $\beta(1, 2) + \beta(2, 1)$ . [ ] I CO4  
A) 0 B) -1 C) 1 D) None.
- Interpret the beta value of  $\beta(\frac{1}{2}, \frac{1}{2})$  is, \_\_\_\_\_. [ ] II CO4  
A)  $\sqrt{\pi}$  B)  $\sqrt{\lambda}$  C)  $\sqrt{2}$  D)  $\pi$ .
- If  $u = xy$  then find,  $\frac{\partial u}{\partial y} =$  [ ] I CO5  
A)  $xy$  B)  $y$  C)  $x+y$  D)  $x$ .
- Interpret the value of  $J\left(\frac{uv}{xy}\right) \cdot J\left(\frac{xy}{uv}\right) =$  [ ] II CO5  
A) 1 B)  $\infty$  C) 0 D) None.
- If  $x = r \cos\theta$ ,  $y = r \sin\theta$  then select,  $\frac{\partial r}{\partial x}$  &  $\frac{\partial r}{\partial y}$  are, [ ] III CO5  
A)  $\frac{x}{r}\tan\theta$  B)  $\frac{x}{r}, \frac{y}{r}$  C)  $\tan\theta, \sin\theta$  D) None.
- If  $u = 3x + y, v = x - 2y$  then assume  $\frac{\partial(u,v)}{\partial(x,y)}$  as, \_\_\_\_\_. [ ] IV CO5  
A) -6 B) 7 C) -7 D) None.
- What is the value of  $\int_{-1}^1 \int_{-2}^2 \int_{-3}^3 dz dy dx$ , \_\_\_\_\_. [ ] I CO6  
A) 12 B) 48 C) 24 D) 36.
- Interpret the value of  $\int_0^1 \int_x^{\sqrt{x}} xy dy dx$ , \_\_\_\_\_. [ ] II CO6  
A)  $\frac{1}{8}$  B)  $\frac{1}{16}$  C)  $\frac{1}{24}$  D) None.
- Identify the integral which suits for  $\iint dx dy$ , \_\_\_\_\_. [ ] III CO6  
A) Surface area of the region B) Volume of the region  
C) Density of the region D) None.
- Simplify the integral  $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} dx dy dz =$  \_\_\_\_\_. [ ] IV CO6  
A)  $\frac{1}{3}$  B)  $\frac{1}{2}$  C)  $\frac{1}{4}$  D)  $\frac{1}{6}$ .

Answer All fill in the blank questions.

Marks: 6Qx1/2M = 3M

- Define Gamma function, \_\_\_\_\_. I CO4
- What is the formula for the Jacobian of  $u, v, w$  with respect to  $x, y, z$  \_\_\_\_\_. I CO5
- Illustrate the Lagrange's function for  $xy$  subject to  $3x^2 + y^2 = 6$ , \_\_\_\_\_. II CO5
- If  $f(x, y) = xy + x - y$  then list the stationary points are, \_\_\_\_\_. IV CO5
- Illustrate the value of  $\int_0^{\pi/2} \int_{-1}^1 x^2 y^2 dx dy$ , \_\_\_\_\_. II CO6
- Solve the triple integral of  $\int_0^a \int_0^x \int_0^y xyz dz dy dx$ , \_\_\_\_\_. III CO6

Answer All Match the following questions.

Marks: 2Qx1M = 2M

17. Select the correct partial derivatives for the values of **l, m, n** are,

I CO5

a) m	i) $\partial^2 f / \partial x^2$
b) n	ii) $\partial^2 f / \partial x \partial y$
c) l	iii) $\partial f / \partial x$
	iv) $\partial^2 f / \partial y^2$

18. Rephrase the suitable limits for the following regions,

II CO6

a) For the area bounded by the curves $y^2 = 4x$ & $x^2 = 4y$	i) $x : 0 \rightarrow 1$ $y : 0 \rightarrow (1 - x)$
b) For the region bounded by the curves $y = x$ & $x^2 = y$	ii) $x : 0 \rightarrow 4$ $y : \frac{x^2}{4} \rightarrow 2\sqrt{x}$
c) For the region R located in positive quadrant for which $x + y \leq 1$	iii) $x : 0 \rightarrow 1$ $y : x^2 \rightarrow x$

### PART – B

Answer any FOUR questions.

Marks: 4Qx5M = 20M

19. Examine find the surface area of a sphere generated by the circle  $x^2 + y^2 = 16$  about its diameter. IV CO3
20. Show that,  $\int_a^b (x - a)^m (b - x)^n dx = (b - a)^{m+n+1} \beta(m + 1, n + 1)$ . II CO4
21. If  $u = \frac{1}{\sqrt{x^2 + y^2 + z^2}}$ ,  $x^2 + y^2 + z^2 \neq 0$  then prove that,  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0$ . II CO5
22. Show that the functions  $u = xy + yz + zx$ ,  $v = x^2 + y^2 + z^2$  and  $w = x + y + z$  are functionally dependent. Find the relation between them. II CO5
23. Develop the stationary points of  $u(x, y) = \text{Sin}x \text{Sin}y \text{Sin}(x + y)$  where  $0 < x < \pi$ ,  $0 < y < \pi$  and find the maximum and minimum values of **u**. III CO5
24. Using the double integration, What is the area of the region bounded by the curve,  $y^2 = 4ax$ ,  $x + y = 3a$  and  $y = 0$ . I CO6

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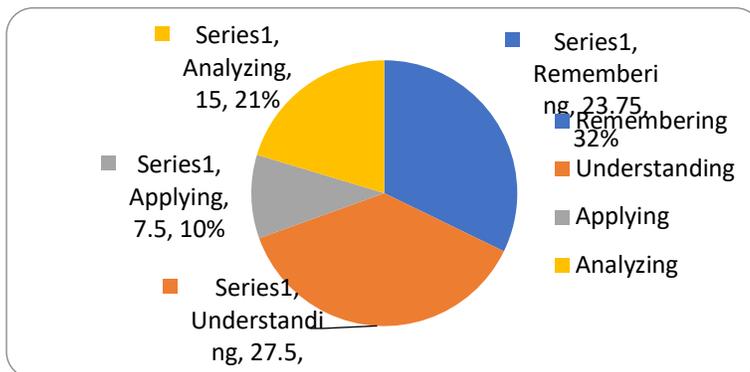
**Sri Indu College of Engineering & Technology :: Sheriguda (V), R.R.Dist**

**Department of Electronics & Communication Engineering**

**CO & BT Mapping for I.B.TECH II-MID Examinations**

Q no.	Marks	Percentage (%)	Course outcome mapping	Bloom's Taxonomy level mapping
1	0.5	1.25	C111.4	Remembering
2	0.5	1.25	C111.4	Understanding
3	0.5	1.25	C111.5	Remembering
4	0.5	1.25	C111.5	Understanding
5	0.5	1.25	C111.5	Applying
6	0.5	1.25	C111.5	Analyzing
7	0.5	1.25	C111.6	Remembering
8	0.5	1.25	C111.6	Understanding
9	0.5	1.25	C111.6	Applying
10	0.5	1.25	C111.6	Analyzing
11	0.5	1.25	C111.4	Remembering
12	0.5	1.25	C111.5	Remembering
13	0.5	1.25	C111.5	Understanding
14	0.5	1.25	C111.5	Analyzing
15	0.5	1.25	C111.6	Understanding
16	0.5	1.25	C111.6	Applying
17	1	2.5	C111.5	Remembering
18	1	2.5	C111.6	Understanding
19	5	12.5	C111.3	Analyzing
20	5	12.5	C111.4	Understanding
21	5	12.5	C111.5	Understanding
22	5	12.5	C111.5	Understanding
23	5	12.5	C111.5	Applying
24	5	12.5	C111.6	Remembering

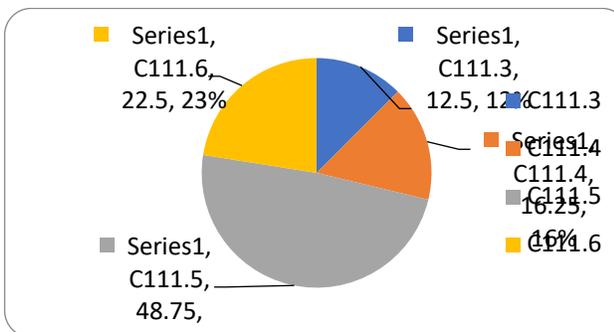
**CO & BT Bloom's Taxonomy level mapping FOR MID 2**



**UNIT WISE MARKS GIVEN IN MID-II EXAM**

CO	MARKS	PERCENTAGE
C111.3	5	12.5
C111.4	6.5	16.25
C111.5	19.5	48.75
C111.6	9	22.5

**CO & BT Bloom's Taxonomy level mapping for MID II**



BR-22

Write Your Ht.No. 

D4

QC1131



## SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi) - Recognized under 2(f) and 12(B) of UGC Act 1956

### IB.Tech.ISemester(REGULAR)End Examinations, March – 2023. (R22MTH1111) MATRICES AND CALCULUS

17/03/2023

(For All Branches)

Day- 1(FN)

Duration: 3 HrsMaximum Marks: 60M

Blooms Taxonomy : (I-Remembering, II-Understanding, III-Appling, IV-Analyzing, V-Evaluating and VI-Creating)

Course Outcomes : CO

#### PART – A

Answer ALL the following questions.

(10Qx1M=10M)

- |   |    |     |
|---|----|-----|
| 1. a) $B = \text{Diag}(1, 2, 3, 4)$ is a 4th order sub square matrix of $12 \times 15$ matrix $A$ , and if all the 5th order minors of $A$ are zeroes, then find the rank of the matrix $A$ . | V  | CO1 |
| b) Express the matrix $\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$ as product of a lower triangular matrix and an upper triangular matrix.  | II | CO1 |
| c) Is it possible to have $\frac{1}{5}(3 - 5i)$ as an Eigenvalue of a Unitary matrix? Explain.  | IV | CO2 |
| d) If the signature of a quadratic form is -2, then what could be the Nature of the quadratic form?   | IV | CO2 |
| e) Write the statement of Cauchy's Mean value theorem.  | I  | CO3 |
| f) Express $\int_0^{\pi/2} \sin^5 \theta \cos^6 \theta d\theta$ in terms of Gamma function.   | II | CO3 |
| g) If $U = xy$ , $x = -t^2 + 2t - 6$ and $y = t^3 - 8$ then find the total derivative of $U$ with respect to $t$ .  | I  | CO4 |
| h) Find the minimum value of $(x + y)^2$ .  | I  | CO4 |
| i) "The two integrals $\int_1^2 \int_3^4 (x + y) dx dy$ and $\int_1^2 \int_3^4 (x + y) dy dx$ are equal". Is this statement true? Explain.  | II | CO5 |
| j) Write the integral which gives the area of the semi-circle above $x$ -axis which is represented by $x^2 + y^2 = 4$ .   | II | CO5 |

#### PART – B

Answer FIVE questions choosing at least one from each unit. (5Qx10M=50M)

##### UNIT-I

- |  |    |     |
|--|----|-----|
| 2. a) Reduce the matrix $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & 7 \end{bmatrix}$ into normal form and hence find its rank. | II | CO1 |
| b) Solve the system of equations $3x + 2y + 7z = 4$ ; $2x + 3y + z = 5$ ; $3x + 4y + z = 7$ by Gauss elimination Method.   | II | CO1 |
| (OR)   |    |     |
| c) Reduce the matrix $A = \begin{bmatrix} 2 & 1 & 3 & 4 \\ 0 & 3 & 4 & 1 \\ 2 & 3 & 7 & 5 \\ 2 & 5 & 11 & 6 \end{bmatrix}$ to the normal form and find its rank.         | II | CO1 |
| d) By Gauss seidel iteration method solve the system of equations:<br>$13x + 2y + z = 16$ ; $2x + 13y + 3z = 18$ ; $3x - 4y + 13z = 12$ .                                | II | CO1 |

**P.T.O.**

**UNIT-II**

3. a) Reduce the Quadratic form  $3x^2 + 5y^2 + 3z^2 - 2xy - 2yz + 2zx$  to the canonical form by orthogonal reduction. Also find the matrix of the transformation responsible for the transformation to canonical form. II CO2
- b) If  $\lambda$  is an Eigen value of an orthogonal matrix A, then show that  $\frac{1}{\lambda}$  is also Eigen value of A. II CO2
- (OR)
- c) Reduce the quadratic form  $x^2 + 2y^2 - 7z^2 - 4xy + 8xz + 5yz$  to canonical form by orthogonal reduction. Find the Nature, index and signature of the quadratic form. II CO2
- d) Is  $\begin{bmatrix} \frac{1}{\sqrt{2}} \\ -2\sqrt{2} \end{bmatrix}$  an Eigenvector of the matrix  $A = \begin{bmatrix} 3 & 1 \\ 4 & 0 \end{bmatrix}$ ? If so, find the eigenvalue corresponding to it. Without solving the characteristic equation find the two Eigenvalues of this matrix? How many independent Eigenvectors this matrix will have corresponding to these eigenvalues? VI CO2

**UNIT-III**

4. a) Prove that  $\frac{\pi}{3} - \frac{1}{5\sqrt{3}} > \cos^{-1} \frac{3}{5} > \frac{\pi}{3} - \frac{1}{8}$  using Lagrange's mean value theorem. IV CO3
- b) Evaluate  $\int_0^{\infty} x^m (\log x)^n dx = \frac{(-1)^n n!}{(m+1)^{n+1}}$  where n is positive integer and  $m > -1$ . III CO3
- (OR)
- c) State Rolle's mean value Theorem and write its geometrical interpretation. Test the validity of the theorem for the functions in the intervals mentioned against them: III CO3
- i)  $|x - 5|$  in  $[2, 8]$ ,  
ii)  $(x - 2)^2$  in  $[-1, 5]$ .
- d) Prove that  $\int_0^{\frac{\pi}{2}} \frac{\sin^{2m-1} \theta \cos^{2n-1} \theta}{(a \sin^2 \theta + b \cos^2 \theta)^{m+n}} d\theta = \frac{\beta(m,n)}{2a^m b^n}$ . IV CO3

**UNIT-IV**

5. a) Find the point on the sphere  $x^2 + y^2 + z^2 = 1$ , nearest to the point (2, 1, 1) using method of Lagrange's multipliers. III CO4
- b) If  $U = x + y + z, V = x^3 + y^3 + z^3 - 3xyz, W = x^2 + y^2 + z^2 - xy - yz - zx$  then find  $\frac{\partial(U,V,W)}{\partial(x,y,z)}$ . What is your comment on the functional dependency of U, V, W. II CO4
- (OR)
- c) If  $u = \log(x^3 + y^3 + z^3 - 3xyz)$ , then show that  $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$ . II CO4
- d) Using the method of Lagrangian multipliers, find the maximum value of  $u = x^2 y^3 z^4$  if  $2x + 3y + 4z = a$ . II CO4

**UNIT-V**

6. a) By change of order of integration, find  $\int_0^a \int_y^a \frac{x}{x^2+y^2} dy dx$ . V CO5
- b) Evaluate  $\iiint_R xyz \, dx dy dz$  over the R which is the positive octant of the sphere  $x^2 + y^2 + z^2 = a^2$ . III CO5
- (OR)
- c) Find the Volume of the Tetrahedron bounded by the plane  $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$  and the co-ordinate planes by triple integration. II CO5
- d) Evaluate  $\iint_R y dx dy$  where R is the region bounded by x-axis, the curve  $y = x^2$  and the line  $x + y = 2$  in the first quadrant. IV CO5

\*\*\*\*\*



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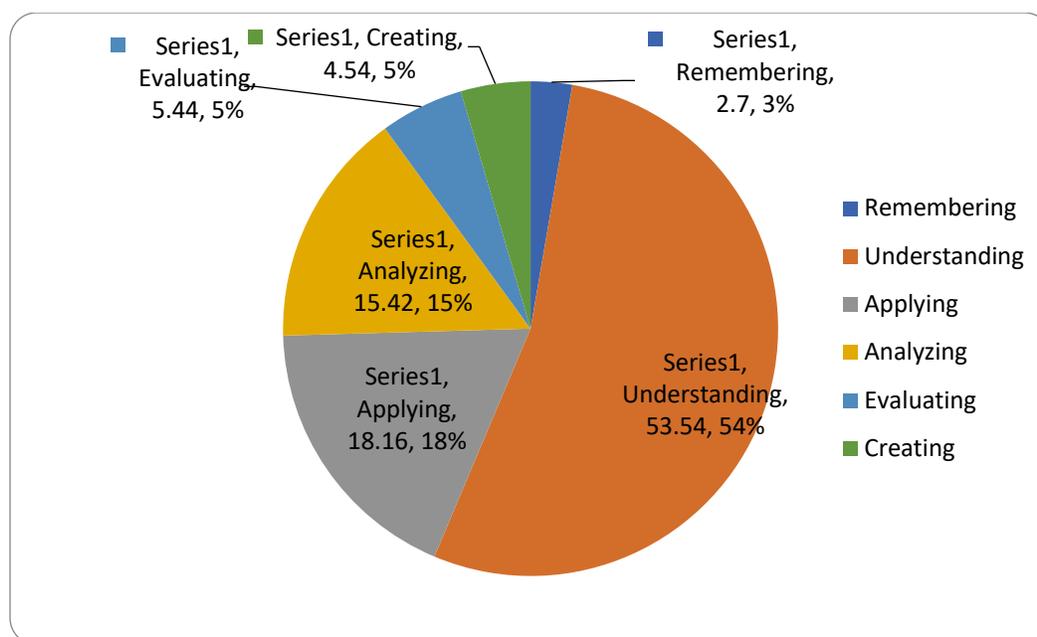
CO & BT Mapping for IB.Tech –I Semester- End Examinations

Remembering II. Understanding, III. Applying, IV. Analyzing, V. Evaluating, VI. Creating)

Q no.	Marks	Percentage (%)	Course outcome mapping	Bloom's Taxonomy level mapping
1 a	1	0.9	C111.1	Evaluating
1 b	1	0.9	C111.1	Understanding
1 c	1	0.9	C111.2	Analyzing
1 d	1	0.9	C111.2	Analyzing
1 e	1	0.9	C111.3	Remembering
1 f	1	0.9	C111.3	Understanding
1 g	1	0.9	C111.4	Remembering
1 h	1	0.9	C111.4	Remembering
1 i	1	0.9	C111.5	Understanding
1 j	4	0.9	C111.5	Understanding
2 a	5	4.54	C111.1	Understanding
2 b	5	4.54	C111.1	Understanding
2 c	5	4.54	C111.1	Understanding
2 d	5	4.54	C111.1	Understanding
3 a	5	4.54	C111.2	Understanding
3 b	5	4.54	C111.2	Understanding
3 c	5	4.54	C111.2	Understanding
3 d	5	4.54	C111.2	Creating
4 a	5	4.54	C111.3	Analyzing
4 b	5	4.54	C111.3	Applying

4 c	5	4.54	C111.3	Applying
4 d	5	4.54	C111.3	Analyzing
5 a	5	4.54	C111.4	Applying
5 b	5	4.54	C111.4	Understanding
5 c	5	4.54	C111.4	Understanding
5 d	5	4.54	C111.4	Understanding
6 a	5	4.54	C111.5	Evaluating
6 b	5	4.54	C111.5	Applying
6 c	5	4.54	C111.5	Understanding
6 d	5	4.54	C111.5	Analyzing

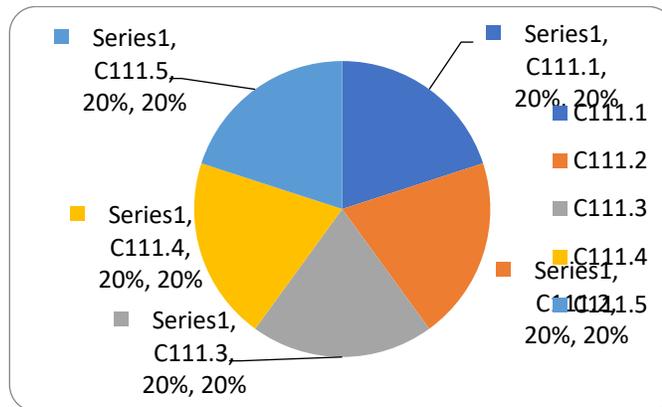
**CO & BT Bloom's Taxonomy level mapping**



**UNIT WISE MARKS GIVEN IN END EXAM**

<b>CO</b>	<b>MARKS</b>	<b>PERCENTAGE</b>
C111.1	22	20%
C111.2	22	20%
C111.3	22	20%
C111.4	22	20%
C111.5	22	20%

**CO & BT Bloom's Taxonomy level mapping**



	<b>SRI INDU COLLEGE OF ENGG &amp; TECH</b> (Regulation :BR22) Department of Electronics and Communications Engineering		<b>Rev1:</b> <b>Pages : 4</b>
	<b>Sub. Code &amp; Title</b>	R22MTH1111 & MATRICES AND CALCULUS	
	<b>Academic Year: 2022-23</b>	<b>Year/Sem./Section</b>	I/I ECE
	<b>Faculty Name &amp; Designation</b>	M.Leela & Assoc.Prof.	

### ASSIGNMENT FOR MID 1

S.No.	Assignment Questions	Course Outcome	Books To be Referred
1	Show that the only real number $\lambda$ for which the system of equations, $x+2y+3z=\lambda$ , $3x+y+2z=\lambda y$ and $2x+3y+z=\lambda z$ has a non-zero solution is 6 and solve them when $\lambda=6$	CO1	T1
2.	Evaluate whether the following system of equations will have a non-trivial solution, if so solve them completely, $4x+2y+z+3w=0$ , $6x+3y+4z+7w=0$ and $2x+y+w=0$	CO1	T1
3.	Apply and verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$ . Hence find $A^{-1}$	CO2	T1
4.	Choose orthogonal transformation to reduce the quadratic form, $3x^2+2y^2+3z^2-2xy-2yz$ to the normal form.	CO2	T1
5.	Examine find the surface area of a sphere generated by the circle $x^2+y^2=16$ about its diameter	CO3	T1



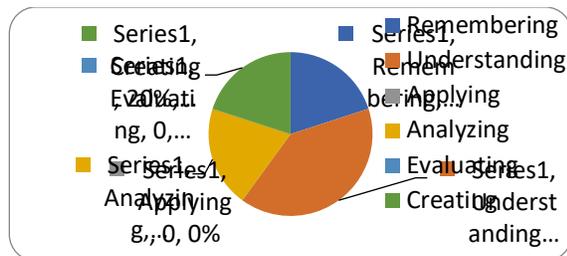
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CO & BT for ASSIGNMENT QUESTIONS MID – I

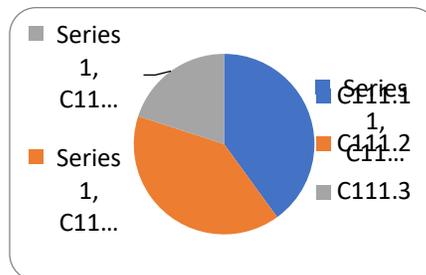
Q no.	Marks	Percentage (%)	Course outcome mapping	Bloom's Taxonomy level mapping
1	1	20	C111.1	Understanding
2	1	20	C111.1	Evaluating,
3	1	20	C111.2	Applying
4	1	20	C111.2	Evaluating
5	1	20	C111.3	Analyzing

CO & BT Bloom's Taxonomy level mapping in assignment for mid-I



UNIT WISE MARKS GIVEN IN ASSIGNMENT-I

CO	MARKS	PERCENTAGE
C111.1	2	40%
C111.2	2	40%
C111.3	1	20%



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	Sub. Code & Title	R22MTH1111 & MATRICES AND CALCULUS	
	Academic Year: 2022-23	Year/Sem./Section	I/I ECE
	Faculty Name & Designation	M.Leela & Assoc.Prof.	

**ASSIGNMENT FOR MID II**

1.	State and show that the relation between Gamma and Beta functions	CO4	T1
2.	Show that the functions $u=xy+yz+z, v=x^2+y^2+z^2$ and $w=x+y+z$ are functionally dependent. Find the relation between them	CO5	T1
3.	Apply Lagrange method of undetermined multipliers to find the maximum value $u=x^2y^3z^4$ if $2x+3y+4z=a$	CO5	T1
4.	Using the double integration, What is the area of the region bounded by the curve, $y^2=4ax, x+y=3a$ and $y=0$	CO6	T1
5..	Change the order of integration and evaluate, $\int_0^{4a} \int_0^{2\sqrt{ax}} dydx$	CO6	T1



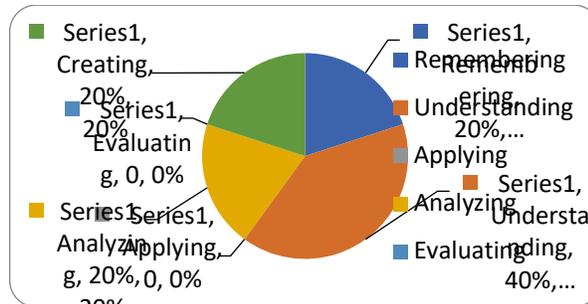
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CO & BT for ASSIGNMENT QUESTIONS MID – II

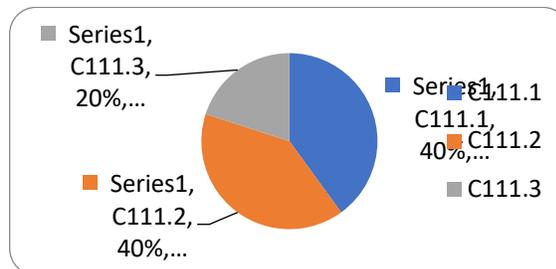
Q no.	Marks	Percentage (%)	Course outcome mapping	Bloom's Taxonomy level mapping
1	1	20	C111.4	Understanding
2	1	20	C111.5	Understanding
3	1	20	C111.5	Analyzing
4	1	20	C111.6	Remembering
5	1	20	C111.6	Creating

CO & BT Bloom's Taxonomy level mapping in assignment for mid-II



UNIT WISE MARKS GIVEN IN ASSIGNMENT-II

CO	MARKS	PERCENTAGE
C111.4	1	20%
C111.5	2	40%
C111.6	2	40%



	<b>SRI INDU COLLEGE OF ENGG &amp; TECH</b> <b>(Regulation :BR22)</b> <b>Department of Electronics and Communications Engineering</b>		<b>Rev1:</b> <b>Pages : 4</b>
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	<b>Academic Year: 2022-23</b>	<b>Year/Sem./Section</b>	I/I ECE
	<b>Faculty Name &amp; Designation</b>	M.Leela & Assoc.Prof.	

## TUTORIAL LESSON PLAN

Unit/ Item No.	Topic (s)	Book Text/ Reference	Page (s)		Type of teaching methodology	Proposed No. of Periods
			From	To		
1	Gauss jacobi's and gauss seidal method	T1	156	162	Black Board	1
2	Lu decomposition method	T2	169	172	Black Board	1
3	Eigen values and Eigen vectors	T1	178	184	Black Board	1
4	Diagonalization problems	R2	438	441	Black Board	1
5	Geometrical interpretation of Mean value theorems	R3	330	354	Black Board	1
6	Applicatios on indefinite integrals	T2	462	465	Black Board	1
7	Applicatios of gamma and beta function	R3	474	482	Black Board	1
8	Partial differentiation concepts	R3	377	387	Black Board	1
9	Finding Maxima and Minima values of two variables	R3	416	417	Black Board	1
10	Statement problems on lagranges method of undetermined multipliers	R3	439	442	Black Board	1
11	Change of variables in jacobian form	T2	358	364	Black Board	1
12	Change of order of integration	T1	324	342	Black Board	1
13	Applications of double integrals in finding areas	T2	365	382	Black Board	1
14	Applications of triple integrals in finding volumes	T2	383	396	Black Board	1
<b>TOTAL</b>						<b>14</b>

**Faculty Signature**



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**Department of Electronics and Communications Engineering**

After 1<sup>st</sup> mid results the analysis made to identify the **weak and advanced learners** to assign different tasks.

The students who got < 60% of our mid or internal evaluation are identified as weak learners as given below, 17 students are identified, for them **Remedial classes** were conducted

**Weak Learners:**

Sl.No.	HT.No.	Sl.No.	HT.No.
1	21D41A0467	9	22D41A0458
2	22D41A0408	10	22D41A0460
3	22D41A0409	11	22D41A0470
4	22D41A0412	12	22D41A0473
5	22D41A0431	13	22D41A0485
6	22D41A0439	14	22D41A04B6
7	22D41A0440	15	22D41A04C1
8	22D41A0450	16	22D41A04C4
		17	22D41A04C9

**Faculty Signature**



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**Advance learners—seminar book:**

Internal marks above 28, the students are identified as the advanced learners. For them seminars / ppts / small project works were assigned

Date	S.No	Roll.No.	Name of the Student	Seminar/PPT/project Topic name	Signature of the student	Remarks	Sign
09/12/22	1	22D41A0401	A LIKHITHA	LU DECOMPOSITION METHOD			
13/12/22	2	22D41A0410	ANANYA BALLALA	GAUSS SEIDAL METHOD			
20/12/22	3	22D41A0418	BODOLLA SANDEEP	SIMILARITY TRANSFORMATION			
26/12/22	4	22D41A0455	KOPPU RAMYASRI	QUADRATIC FORMS			
3?1/23	5	22D41A0464	MADDI MANISHA	GEOMETRICAL INTERPRETATION OF LMVT			
7/1/23	6	22D41A0475	NAGILLA SRAVANI	FORMS OF BETA FUNCTIONS			
18/1/23	7	22D41A0476	NAGULA KEERTHI	CONCEPTS OF PARTIAL DIFFERENTIATION			
20/1/23	8	22D41A0491	PEDDI ANJALI	MAXIMA AND MINIMA OF TWO VARIABLES			
23/1/23	9	22D41A04A0	RAMAVATH RAGHAVENDRA	DOUBLE INTEGRALS IN POLAR FORM			
09/02/23	10	22D41A04A3	SANDHYA JUPALLY	AREAS AS DOUBLES INTEGRALS			
13/02/23	11	22D41A04A8	SURAM SRIJA	CONCEPT ON 3-D GEOMETRY			
20/02/23	12	22D41A04B2	THAMMISHETTY SHREEJA	CHANGE OF VARIABLES IN JACOBIAN FORM			

25/2/23	13	22D41A04B4	THOKALA SAI CHANDANA	CHANGE OF ORDER OF INTEGRATION			
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**Faculty Signature**



**Sri Indu College of Engineering & Technology :: Sheriguda (V),  
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Department of Electronics and Communications Engineering**

**Course Outcome Assessment**

Course : ECE AY: 2022-23  
CLASS: I B.Tech SEM: 1<sup>st</sup> Semester

S.No	Roll Number	1st Internal Exam	2nd Internal Exam	END Exam
	Max Marks	40	40	60
1	21D41A0467	22	31	21
2	21D41A04G2	A	A	AB
3	22D41A0401	36	35	28
4	22D41A0402	23	33	24
5	22D41A0403	21	34	21
6	22D41A0404	20	24	21
7	22D41A0405	20	29	22
8	22D41A0406	20	39	50
9	22D41A0407	24	30	21
10	22D41A0408	20	24	21
11	22D41A0409	21	23	22
12	22D41A0410	36	39	39
13	22D41A0411	21	29	22
14	22D41A0412	19	28	10

15	22D41A0413	21	26	21
16	22D41A0414	34	38	39
17	22D41A0415	26	37	23
18	22D41A0416	32	38	26
19	22D41A0417	32	37	42
20	22D41A0418	37	32	30
21	22D41A0419	27	24	21
22	22D41A0420	21	26	22
23	22D41A0421	30	30	28
24	22D41A0422	33	37	33
25	22D41A0423	24	31	8
26	22D41A0424	28	32	30
27	22D41A0425	31	37	13
28	22D41A0426	24	33	32
29	22D41A0427	25	24	6
30	22D41A0428	27	20	6
31	22D41A0429	25	28	26
32	22D41A0430	27	33	43
33	22D41A0431	19	20	4
34	22D41A0432	25	20	13
35	22D41A0433	23	29	25
36	22D41A0434	19	24	22
37	22D41A0435	19	22	22
38	22D41A0436	34	35	35

39	22D41A0437	24	23	26
40	22D41A0438	19	22	21
41	22D41A0439	19	26	21
42	22D41A040	20	20	22
43	22D41A041	23	20	6
44	22D41A0442	29	15	18
45	22D41A0443	29	26	24
46	22D41A0444	30	35	30
47	22D41A0445	26	35	27
48	22D41A0446	19	20	7
49	22D41A0447	19	17	7
50	22D41A0448	22	20	4
51	22D41A0449	23	23	22
52	22D41A0450	22	21	8
53	22D41A0451	31	32	24
54	22D41A0452	22	23	13
55	22D41A0453	23	23	15
56	22D41A0454	25	20	10
57	22D41A0455	36	39	39
58	22D41A0456	32	32	9
59	22D41A0457	30	20	4
60	22D41A0458	20	22	5
61	22D41A0459	19	21	9
62	22D41A0460	20	20	6

63	22D41A0461	30	36	29
64	22D41A0462	25	28	21
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66	22D41A0464	39	38	37
67	22D41A0465	27	25	9
68	22D41A0466	25	32	26
69	22D41A0467	28	31	23
70	22D41A0468	29	29	25
71	22D41A0469	28	32	24
72	22D41A0470	21	27	28
73	22D41A0471	10	10	AB
74	22D41A0472	28	26	14
75	22D41A0473	19	22	21
76	22D41A0474	30	32	36
77	22D41A0475	37	37	46
78	22D41A0476	38	38	31
79	22D41A0477	26	29	22
80	22D41A0478	20	29	10
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83	22D41A0481	25	33	12
84	22D41A0482	31	33	29
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86	22D41A0484	30	32	29

87	22D41A0485	19	20	13
88	22D41A0486	24	32	22
89	22D41A0487	34	36	43
90	22D41A0488	21	30	21
91	22D41A0489	22	33	25
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97	22D41A0495	25	31	25
98	22D41A0496	21	26	21
99	22D41A0497	24	31	25
100	22D41A0498	34	39	30
101	22D41A0499	32	37	13
102	22D41A04A0	36	37	36
103	22D41A04A1	31	38	8
104	22D41A04A2	29	37	14
105	22D41A04A3	35	38	43
106	22D41A04A4	17	28	0
107	22D41A04A5	25	37	9
108	22D41A04A6	29	38	36
109	22D41A04A7	31	37	22
110	22D41A04A8	38	36	31

111	22D41A04A9	20	31	21
112	22D41A04B0	26	32	21
113	22D41A04B1	27	33	25
114	22D41A04B2	37	36	42
115	22D41A04B3	20	36	14
116	22D41A04B4	36	38	41
117	22D41A04B5	19	28	7
118	22D41A04B6	19	28	8
119	22D41A04B7	21	32	12
120	22D41A04B8	19	35	21
121	22D41A04B9	31	32	28
122	22D41A04C0	20	28	13
123	22D41A04C1	10	21	22
124	22D41A04C2	28	31	25
125	22D41A04C3	19	13	7
126	22D41A04C4	22	20	11
127	22D41A04C5	29	34	28
128	22D41A04C6	31	37	37
129	22D41A04C7	21	24	2
130	22D41A04C8	23	25	23
131	22D41A04C9	20	20	5
Students scored more than 60% marks		126	71	33
Total no.of students		131	131	131
% of marks		96.18%	54.19%	26%



CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>C111.1</b>	2	3	3	1	-	-	-	-	-	-	-	2	2	2	2
<b>C111.2</b>	3	2	2	1	-	-	-	-	-	-	-	1	3	2	3
<b>C111.3</b>	1	3	3	2	-	-	-	-	-	-	-	1	2	2	1
<b>C111.4</b>	3	2	1	1	-	-	-	-	-	-	-	1	3	2	3
<b>C111.5</b>	1	2	2	3	-	-	-	-	-	-	-	2	2	2	1
<b>C111.6</b>	3	2	2	2	-	-	-	-	-	-	-	1	3	2	3
<b>C111</b>	<b>2.17</b>	<b>2.33</b>	<b>2.17</b>	<b>1.67</b>	-	-	-	-	-	-	-	<b>1.33</b>	<b>2.5</b>	<b>2</b>	<b>2.17</b>



CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	1	-	-	-	-	-	-	-	2	2	2	2
CO2	3	2	2	1	-	-	-	-	-	-	-	1	3	2	3
CO3	1	3	3	2	-	-	-	-	-	-	-	1	2	2	1
CO4	3	2	1	1	-	-	-	-	-	-	-	1	3	2	3
CO5	1	2	2	3	-	-	-	-	-	-	-	2	2	2	1
CO6	3	2	2	2	-	-	-	-	-	-	-	1	3	2	3
OVER ALL															
TARGET															
STATUS															

**Programme Specific Outcome Assessment**

	CO1	CO2	CO3	CO4	CO5	CO6	OVER ALL ATTAINMENT
PSO1							
PSO2							
PSO3							

Best Performing Course Outcome

Least Performing Course Outcome

Observations/ Reasonsfor Low :

attainment

1	Additional Content was not covered.
2	Some Tutorials were not implemented.

Corrective measures/Action items:

1	More basics for filters required.
2	Tutorial Plan Sheet should be improved.

**FACULTY SIGNATURE**



**Sri Indu College of Engineering & Technology :: Sheriguda (V), R.R.Dist**

**Department of Electronics and Communications Engineering**

**I-B.TECH CSE I-SEMESTER RESULT ANALYSIS**

<b>A.Y</b>	<b>SUBJEC</b>	<b>NO OF</b>	<b>QUESTION PAPER</b>	<b>PASS %</b>
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	T NAME	STUDENTS		SETTING		
		APPEARED	PASSED	INTERNAL	EXTERNAL	
2022-23	MATRICES AND CALUCUS	129		COURSE INSTRUCTOR	EXPERTS COMMITTEE	

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