

Common to all Mtech programs in CSE board			
MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE			
Course Code	22SCE11, 22SCN11, 22SCS11, 22SIT11, 22SSE11, 22SFC11, 22SNI11, 22SAM11, 22SDS11, 22SAD11, 22SCR11, 22SWT11, 22VSC11, 22VSA11	CIEMarks	50
Teaching Hours/Week (L:P:SDA)	3:0:0	SEEMarks	50
Total Hour of Pedagogy	40	TotalMarks	100
Credits	03	ExamHours	03
Course Learning objectives:			
<ul style="list-style-type: none"> • Ability to analyze the solution & examine its stability in operator theory. • Ability to optimize & solve real life problems. • Ability to solve image processing & signal processing problems 			
Module-1			
Vector Spaces: Vector spaces; subspaces Linearly independent and dependent vectors Basis and dimension; coordinate vectors - Illustrative examples. Linear transformations, Representation of transformations by matrices; (RBT Levels: L1 & L2) (Textbook: 1)			
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation		
Module-2			
Orthogonality and least squares: Inner product, orthogonal sets, orthogonal projections, orthogonal bases. Gram Schmidt orthogonalization process. QR factorization of a matrix, least square problems, applications to linear models (least square lines and least square fitting of other curves). (RBT Levels: L2 & L3) (Textbook: 1)			
Teaching-Learning Processes	Chalk and talk method / PowerPoint Presentation		
Module-3			
Eigenvalues and Eigenvectors, orthogonal diagonalization, Singular value decomposition, applications to image processing and statistics, Principal Component Analysis, Differential Equations. (RBT Levels: L2 & L3) (Textbook-1)			
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation		
Module-4			
Sampling theory: testing of hypothesis by t-test, χ^2 test, F-test., Analysis of Variance (ANOVA): one way classification. (RBT Levels: L2 and L3) (Textbook: 3 & Ref. book: 6)			
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation		
Module-5			
Fourier series and Transform: Fourier series, integrals and transforms and their properties. One dimensional Fourier transform, Convolution theorem, Parseval's Identity formula and problems Introduction to 2-dimensional Fourier transform. (RBT Levels: L1 & L2) (Textbook: 2)			
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation		

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Three Unit Tests each of 20 Marks
2. Two assignments each of 20 Marks or one Skill Development Activity of 40 marks to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be scaled down to 50 marks

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module.

Suggested Learning Resources:**Text Books**

1. David C. Lay, Steven R. Lay and J.J. McDonald, "Linear Algebra and its Applications", Pearson Education Ltd, 5th Edition 2015.
2. Dr. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd edition, 2012.
3. Probability, Statistics and Random Process T. Veerarajan Tata Mc-Graw Hill Co 3rd Edition 2016

References Books

4. I.N. Sneddon, Fourier Transform
5. Kreyzig, "Advanced Engineering Mathematics".
6. R.E, Walpole, R.H. Myres, S.L. Myres and Keying Ye, "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson, 2012.

Skill Development Activities Suggested

- The students with the help of the course teacher can take up technical –activities which will enhance their skill or the students should interact with industry (small, medium and large), understand their problems or foresee what can be undertaken for study in the form of research/testing/projects, and for creative and innovative methods to solve the identified problem. The prepared report shall be evaluated for CIE marks.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

Sl.No.	Description	Blooms Level
CO1	Understand vector spaces and related topics arising in magnification and rotation of images.	L1 & L2
CO2	Compute orthogonal and orthonormal basis vectors required to analyze image and signal Processing problems	L2 & L3
CO3	Apply the technique of singular valued decomposition for data compression, least square approximation in solving inconsistent linear systems	L2 & L3
CO4	Understand probabilistic concepts required to test the hypothesis and take decision using Analysis of variance.	L2 & L3
CO5	Understand one and two dimensional Fourier transform	L1 & L2

Program Outcome of this course

Sl.No.	Description	POs
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and computer science and business systems to the solution of complex engineering and societal problems.	PO1
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering and business problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3	Design/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.	PO3
4	Conduct investigations of complex problems: 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.	PO4
5	Modern tool 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	PO5
6	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 and business practices.	PO6
7	Environment and sustainability: Understand the impact of the professional engineering solutions in business societal and environmental contexts, and demonstrate the knowledge of, and need for, sustainable development.	PO7
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering and business practices.	PO8
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	PO9
10	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.	PO10
11	Project management and finance: Demonstrate knowledge and understanding of the engineering, business 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.	PO11
12	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.	PO12

Mapping of COs and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		X										
CO2	X											
CO3		X										
CO4	X	X										