Course Title	Mathematics for AI & ML		
Course Code	25MAAI301	**(L-T-P) C**	**(3-0-0) 3**
Exam	3 hours	**Hours/Week**	**03**
SEE	50 marks	**Total Hours**	**42L + 48ABL = 90**

Course Objective: To equip students with a strong foundation in linear algebra and computational statistics, enabling them to model and solve real-world problems in artificial intelligence, machine learning, and engineering, analyze and interpret data, make informed decisions based on statistical evidence, and effectively communicate analytical findings.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply concepts of linear algebra, vector spaces, descriptive statistics, probability distributions, sampling theory, and statistical inference to formulate and solve mathematical, statistical, and engineering problems.	1	-
2.	Analyze mathematical models and datasets using linear algebra, vector space techniques, probability distributions, statistical inference, hypothesis testing, and data analysis methods to support effective problem-solving and decision-making.	2	-
4.	Develop mathematical and statistical models for real-life engineering and analytical problems.	2,3	-

Course Contents:

MODULE -1	**10 Hours**

Linear Algebra: Importance of Matrices. Rank of a matrix. Nullity of matrix. Consistency of homogeneous and non-homogeneous system of equations, Computation of Eigen value and Eigen vectors, Diagonalization and powers of 3X3 matrices when Eigen values are already given.

Applications: Traffic - flow problem. Applications to web page ranking.

Self-Study- Application of Eigen value Eigen vectors in Signature testing, Jordan canonical matrices

MODULE - 2	**10 Hours**

Vector Space: Basics of- Vector space, subspace, basis and dimension. Linearly dependent and independent vectors. Orthogonal sets, Orthogonal projections, Gram-Schmidt process, QR-factorization, least-square problems, Singular value decomposition.

Applications of Principal component analysis- to data compression and image processing.

Self-Study- Face recognition. Bases for Null space and Column space. Change of basis.

MODULE-3	**10 Hours**

Descriptive Statistics: Mean, variance and standard deviation.

Probability distributions: Continuous Probability distribution, Exponential distribution, Normal distribution, Uniform distribution.

Applications: AI-based traffic systems, face-recognition system

Self-study: Data visualization techniques (histograms, boxplots, QQ- plots).

MODULE - 4	12 Hours
Sampling and its Properties: Sampling methods and techniques, Point estimation and confidence intervals, Sample size determination. **Hypothesis Testing:** Introduction to hypothesis testing- Null and alternative hypotheses, Type I and Type II errors, significance level, and p-values. Parametric Tests: One-sample and two-sample-z-tests, t-tests. Chi-square test for independence of test. **Applications:** Cloud server performance analysis, Cyber-security login analysis **Self-study:** Drying time problem	

Note – Theorems and properties without proof. Applicable to all the modules.

Self-study is not included in SEE

Prescribed Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Statistics	S C Gupta	7	Himalaya Publishing House	
2.	Statistics for Business: Decision Making and Analysis	Robert Stine	2	Pearson	2017
3.	Probability, Statistics and Random Process	T Veerarajan	3	Tata McGraw Hill Co.	2008
4.	Linear Algebra and its Applications	David C. Lay, Steven R. Lay and J.J. Mc Donald	5	Pearson Education Ltd	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Advanced Engineering Mathematics	E. Kreyszig	10	Wiley	2015
2.	Linear Algebra and its Applications	Gilbert Strang	4	Cenage publications	2014
3.	Probability and Statistics	Murray R. Spiegel, John J. Schiller & R. Alu Srinivasan	4	McGraw-Hill	2012

E Books and online course materials:

1. **https://www.coursera.org/learn/the-power-of-statistics**
2. **https://nptel.ac.in/courses/110107114**
3. **https://www.geneseo.edu/~aguilar/public/assets/courses/233/main_notes.pdf**

Online Courses and Video Lectures:

1. **https://www.coursera.org/learn/stanford-statistics**
2. **https://www.coursera.org/learn/machine-learning-probability-and-statistics**
3. **https://onlinecourses.nptel.ac.in/noc21_ma74**
4. **https://www.coursera.org/learn/introduction-to-linear-algebra**
5. **https://www.coursera.org/learn/linear-algebra-machine-learning**
6. **https://archive.nptel.ac.in/courses/111/106/111106135/**

Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours – Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	27
4	Evaluation of Learning Process	-	-	07
Total Learning Hours / Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Activity Based Learning (27 Hours)

ABL 1 (14 Hours) : Activity 1 details		**Hours**
Writing Assignment with Problems on concerned to real world applications.	Submission of the final assignment report and evaluation. (Questions of Blooms level L3 and Higher)	14
Total		**14**
ABL 2 (13 Hours): Activity 2 details		

Problem Solving Assignment	Understand the input data requirements	1
	Formulate the methodology	4
	Design the solution	4
	Solving the problem and submission	4
Total		**13**

Evaluation of Learning Process (7 Hours)

Type of Evaluation	**Hours**
Test (1 and 2)	3
Activity (1 and 2)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes [POs]**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-											
CO2	-	3	-										
CO3	-	2	1										

Course Title	Computational Statistics		
Course Code	25MACB301	**(L-T-P) C**	**(3-0-0) 3**
Exam	3 hours	**Hours/Week**	**03**
SEE	50 marks	**Total Hours**	**42L + 48ABL = 90**

Course Objective: To equip students with a solid foundation in computational statistics, enabling them to analyze and interpret data, make informed decisions based on statistical evidence, and effectively communicate statistical findings.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping To PSOs
1.	Apply concepts of probability distributions, joint probability distributions, Markov chains, sampling theory, statistical estimation, and hypothesis testing to formulate and solve mathematical, statistical, and engineering problems.	1	-
2.	Analyze probabilistic models and statistical data using Markov chains, regression analysis, analysis of variance, sampling techniques, and hypothesis testing to support data-driven decision-making and problem-solving.	2	-
4.	Develop mathematical and statistical models for real-life engineering and analytical problems.	2,3	-

Course Contents:

MODULE - 1	**08 Hours**

Continuous Random Variables: Probability density function, Cumulative distribution function, Mean and Variance. Exponential distribution, Uniform distribution, and Normal distribution.

Applications: AI-based traffic systems, face-recognition system

Self-study: Measures of central tendency: mean, median, and mode.

MODULE - 2	**12 Hours**

Joint Probability Distribution: Joint distributions of discrete random variables-Marginal probability distribution, Independent random variables, expectation, co-variance, and correlation.

Markov Chains: Introduction to stochastic process Probability vector, Stochastic matrices, Regular stochastic matrices, transition probability matrix, higher transition-probabilities, stationary distribution of regular Markov chains.

Applications: Application of Markov chain to determine the voting tendencies, Recommendation Analysis on OTT platforms

Self-study: Joint probability distribution-Continuous random variables.

MODULE-3	**12 Hours**

Sampling and its Properties: Sampling methods and techniques, Point estimation and confidence intervals, Sample size determination.

Hypothesis Testing: Introduction to hypothesis testing- Null and alternative hypotheses, Type I and Type II errors, significance level, and p-values. Parametric Tests: One-sample and two-sample-z-tests, t-tests. Chi-square test for independence of test.

Applications: Cloud server performance analysis, Cyber-security login analysis **Self-study:** drying time problem, F-test Analysis of variance.	
MODULE - 4	**10 Hours**
Regression Analysis- Simple linear regression: Assumptions and interpretation. Coefficient of determination (R-squared). Multiple Regression Analysis **Analysis of Variance (ANOVA):** One-way ANOVA and two-way ANOVA. **Self-study:** Model assumptions and diagnostics, Variable selection techniques (stepwise, backward, forward), Analysis of Categorical Data	

Note – Theorems and properties without proof. Applicable to all the modules.

Self-study is not included in SEE

Prescribed Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Statistics	S C Gupta	7	Himalaya Publishing House	
2.	Statistics for Business: Decision Making and Analysis	Robert Stine	2	Pearson	2017
3.	Probability, Statistics and Random Process	T Veerarajan	3	Tata McGraw Hill Co.	2008

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Statistics for Business	Perumal Mariappan	-	CRC press	2019
2.	Probability and Statistics	Murray R. Spiegel, John J. Schiller & R. Alu Srinivasan	4	McGraw-Hill	2012

E Books and online course materials:

1. **https://www.coursera.org/learn/the-power-of-statistics**
2. **https://nptel.ac.in/courses/110107114**

Online Courses and Video Lectures:

1. **https://www.coursera.org/learn/stanford-statistics**
2. **https://www.coursera.org/learn/machine-learning-probability-and-statistics**
3. **https://onlinecourses.nptel.ac.in/noc21_ma74**

Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42

2	Integrated Lab Component	-	-	-
3	Student Study Hours – Self Learning	1	14	14
3	Activity Based Learning (ABL1 & ABL2)	-	-	27
4	Evaluation of Learning Process	-	-	07
Total Learning Hours / Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Activity Based Learning (27 Hours)

ABL 1 (14 Hours) : Activity 1 details		**Hours**
Writing Assignment with Problems on concerned to real world applications.	Submission of the final assignment report and evaluation. (Questions of Blooms level L3 and Higher)	14
Total		**14**
ABL 2 (13 Hours): Activity 2 details		
Problem Solving Assignment	Understand the input data requirements	1
	Formulate the methodology	4
	Design the solution	4
	Solving the problem and submission	4
Total		**13**

Evaluation of Learning Process (7Hours)

Type of Evaluation	**Hours**
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes[POs]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-											
CO2	-	3											
CO3	-	2	1										

Course Title	Mathematics-III for Computer Science Engineering		
Course Code	25MACS301	(L-T-P)C	(3-0-0) 3
Exam	3 hours	Hours/Week	03
SEE	50 marks	Total Hours	42L + 48ABL = 90

Course Objective: To expertise linear algebra and probability theory which can be employed as tools in solving engineering application problems.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply concepts of linear algebra, probability distributions, sampling theory, and Markov chains to formulate and solve mathematical, statistical, and engineering problems.	1	-
2.	Analyze systems involving linear transformations, probability distributions, Markov chains, stochastic processes and statistical inference using appropriate mathematical techniques for data-driven decision-making.	2	-
3.	Develop mathematical and statistical models for real-life engineering and analytical problems.	2,3	-

Course Contents:

MODULE-1	08 Hours

Continuous Random Variables: Probability density function, Cumulative distribution function, Mean and Variance. Exponential distribution, Uniform distribution and Normal distribution.

Applications: AI-based traffic systems, face-recognition system

Self-Study: Gamma distribution

MODULE-2	12 Hours

Joint probability distribution: Joint distribution of Discrete random variables- Marginal probability distribution, Independent random variable**,** Expectation, Covariance, Correlation coefficient.

Markov chains: Introduction to stochastic process, probability vectors, stochastic matrices, regular stochastic matrices, higher transition probabilities, stationary distribution of regular Markov chains.

Application: Application of Markov chain to determine the voting tendencies, Recommendation Analysis on OTT platforms

Self-Study: Joint probability distribution-Continuous random variables.

MODULE-3	12 Hours

Sampling Theory- Introduction to sampling distribution

Confidence intervals and Hypothesis testing: Testing a hypothesis, central limit theorem, concepts of standard error and confidence interval, level of significance, type I and type II errors, one tailed and two tailed tests, Z-test: for single mean, for single proportion and for difference between means, for difference between proportion. Student's t –test: for

single mean and for difference between two means, Chi-square test: for goodness of fit and for independence of attributes. **Applications:** Cloud server performance analysis, Cyber-security login analysis **Self-Study**— drying time problem, F-test Analysis of variance.	
MODULE-4	**10 Hours**
Linear Algebra: Importance of Matrices. Rank of a matrix. Consistency of the system of linear equations, Solution of the system of linear equations by Gauss elimination. Linear transformation: Special matrices-matrix of rotation, reflection and translation. Eigen values and Eigenvectors-Illustrative examples. **Applications:** transformation of 3D coordinate in Robotic arm, web-page ranking. **Self-Study--** Application of Eigen value Eigen vectors in Signature testing, Jordan canonical matrices	

Note– Theorems and properties without proof. Applicable to all the modules.

Self-study is not included in SEE

Prescribed Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Higher Engineering Mathematics	Dr. B. S. Grewal	44	Khanna Publications	2016
2.	Linear algebra and its application	David c lay	5	Pearson education	2023

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Advanced Engineering Mathematics	E.Kreyszig	10	Wiley	2015
2.	Advanced engineering mathematics	R K Jain and S R K Iyengar	5	Pearson education	2019
3.	Calculus	Thomas Finney	9	Pearson education	2002

EBooks and online course materials:

1. https://www.geneseo.edu/~aguilar/public/assets/courses/233/main_notes.pdf

Online Courses and Video Lectures:

1. https://www.coursera.org/learn/introduction-to-linear-algebra
2. **https://www.coursera.org/learn/stanford-statistics**
3. **https://onlinecourses.nptel.ac.in/noc21_ma74**
4. https://archive.nptel.ac.in/courses/111/106/111106135/

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
3	Activity Based Learning (ABL1&ABL2)	-	-	27
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**120**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity1 2) Details of activity2	20
Total		**50**

Activity Based Learning (27 Hours)

ABL 1(14 Hours): Activity1 details		**Hours**
Writing Assignment with Problems on concerned to real world applications.	Submission of the final assignment report and evaluation. (Questions of BloomslevelL3andHigher)	14
Total		**14**
ABL2(13 Hours): Activity2 details		
Problem Solving Assignment	Understand the input data requirements	3
	Formulate the methodology	5
	Design the solution	5
	Solving the problem and submission	5
Total		**13**

Evaluation of Learning Process
(7Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes[POs]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-											
CO2	-	3											
CO3	-	2	1										

Course Title	Mathematics-III for Electrical and Electronics Engineering		
Course Code	25MAEE301	(L-T-P)/C	(3-1-0)/3
Exam	3 hours	Hours/Week	04
SEE	50 marks	Total Hours	42L+ 48ABL =90

Course Objective: To introduce linear algebra and transform calculus which may be employed as tools in solving engineering application problems.

Course Outcomes(COs): Upon completion of the course, students shall be able to:

COs .	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the concepts of linear algebra, linear transformations, Fourier series, Fourier transforms, and Z-transforms to solve basic mathematical problems.	PO1	-
2.	Apply matrix methods, orthogonal transformations, Fourier techniques, and Z-transforms to solve engineering problems of moderate complexity.	PO2	-
3.	Analyze and solve engineering application problems involving circuit analysis, smart grid systems, electric motor control, antenna arrays, signal processing, and loaded string deflection using appropriate mathematical techniques.	PO2, PO3	-

Course Contents:

MODULE-1	10 Hours

Linear Algebra: Importance of Matrices, Elementary row transformation, Rank of a matrix. Consistency of the system of equations - Gauss elimination method, Gauss – Seidel iterative method.

Eigen values: Importance of Eigen values and Eigen vectors, Rayleigh power method to find the highest Eigen value. Diagonalization and powers of 3X3 matrices when Eigen values are already given.

Applications: circuit flow problem, Smart Grid Systems using Eigen Values.

Self Study -Traffic flow problem, To find the suitable combination of food stuff so as to get the desired nutrients as prescribed by a dietician.

MODULE-2	10 Hours

Linear transformation: Introduction, Matrix representation of transformation, image of a matrix under the transformation - matrix of rotation, reflection, translation for a given point.

Orthogonality: Dot product, definition, orthogonal projection, orthogonal bases, Gram Schmidt process, least squares method, singular value decomposition (SVD).

Application: vector control in electric motor devises antenna array face symmetry.

Self-Study- Matrix factorization - LU decomposition, QR decomposition.

MODULE-3	10 Hours

Fourier Series: Importance, Concepts, **Periodic** function, Dirichlet's condition. Fourier series expansion of functions and their graphical representation, Fourier series of Odd & Even functions, Half range series method, Practical harmonic analysis.

Application of Fourier series -To represent the signal (wave form) in terms of Fourier series, Fourier series representation for the excitation described by the wave form.

Self-Study- Basic idea of converting signals from time domain to frequency domain, Difference between periodic and non-periodic signals.

MODULE-4	**12Hrs.**

Fourier Transform: Introduction, Evaluation of Complex Fourier transform, Properties of Fourier transform (Linearity, Change of Scale, Shifting), Fourier sine & Fourier cosine transforms.

Inverse Fourier Transform: Inverse Fourier transforms, Inverse Fourier cosine and sine transforms.

Z-Transforms: Introduction, Definition of Z-transforms, Z-transforms for some standard functions, Properties- Linearity property, Damping rule, Shifting rule.

Inverse Z-transforms- Partial fraction method, Solution of Difference equations using Z-Transforms.

Application- Deflection of a loaded string.

Self-Study-Initial value theorem, Final value theorem– Problems, Fast Fourier transforms.

Note – Theorems and properties without proof. (Applicable to all the modules.)

Self-study is not included in SEE

Prescribed Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Linear Algebra and its Applications	David C. Lay, Steven R. Layand J.J. Mc Donald	5 ISBN-10:9350 517698	Pearson Education Ltd	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Advanced Engineering Mathematics	E.Kreyszig	10	Wiley	2015
2.	Linear Algebra and its Applications	Gilbert Strang	4	Cenage publications	2014

EBooks and online course materials:

1. https://www.geneseo.edu/~aguilar/public/assets/courses/233/main_notes.pdf

Online Courses and Video Lectures:

1. https://www.coursera.org/learn/introduction-to-linear-algebra
2. https://www.coursera.org/specializations/linear-algebra-elementary-to-advanced
3. https://archive.nptel.ac.in/courses/111/106/111106135/

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Activity Based Learning	20
Total		**50**

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
CIE (1and 2)	3
Activity (1 and 2)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes[POs]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3												
CO2		3											
CO3		2	1										

Course Title	Discrete Mathematics and Probability Theory		
Course Code	25MARA301	LTPC	(3-0-0)3
Exam	04 Hours	Hours / Week	3
SEE	50 Marks	Total hours	42L+48ABL=90

Course Objective: To introduce the students to probability and statistics for Mechanical Engineering through an understanding of the descriptive statistics and probability to analyze distributions and relationship of real-time data.

Course Outcomes (COs) {with mapping shown against the **Program Outcomes (POs)}**

Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs
1.	Apply concepts of mathematical logic, discrete mathematics, probability, and statistical inference to solve mathematical and engineering problems.	1
2.	Analyze mathematical and statistical models using relations, functions, combinatorics, probability distributions, sampling, and hypothesis testing for effective problem-solving and decision-making.	2
3.	Develop mathematical and statistical models for real-life engineering and analytical problems.	2,3

Course contents:

Module -1	10 Hrs.
Mathematical Logic Propositions and logical operations, truth tables, logical equivalence, predicates and quantifiers. **Relations** Relations and their properties, partial order and total order relations Hasse- diagram. Matrix representation of relations, directed graph representation of relations, transitive closure of relations. **Application:** Warshall's algorithm. **Self-Study**: Methods of proof: Rules of inference, equivalence relations.	
Module -2	**11 Hrs.**
Functions Functions and their types: injective, surjective and bijective functions, composition and inverse functions **Combinatorics** Basic counting principles, permutations and combinations, combinations with repetition. Linear recurrence relations, Principle of Inclusion and Exclusion, generalized inclusion-exclusion, derangements and applications. Generating functions. **Application:** Using Inclusion and Exclusion principle devising a system of two- way roads **Self-Study:** Catalan numbers and applications, Fibonacci sequence and applications.	
Module - 3	**11 Hrs.**
Probability Theory and Random Variables One-Dimensional Random Variable: Discrete and Continuous Random Variable, Probability Functions, Cumulative Distribution Function, Expectation and Variance. **Discrete and continuous Probability Distributions** Binomial, Poisson, Normal and Exponential Distributions **Application:** AI-based traffic systems, face-recognition system **Self-Study** : Uniform Distributions	
Module - 4	**10 Hrs.**
Joint Distribution: Probability Density Function, Marginal Distribution, Expectation, Variance, Covariance and Correlation	

Sampling Theory- Introduction to sampling distribution

Confidence intervals and Hypothesis testing: Testing a hypothesis, central limit theorem, concepts of standard error and confidence interval, level of significance, type I and type II errors, one tailed and two tailed tests, Z-test: for single mean, for single proportion and for difference between means, for difference between proportion.

Application: Cloud server performance analysis, Cyber-security login analysis

Self-Study : student-t distribution.

Note – Theorems and properties without proof. Applicable to all the modules.
Self-study is not included in SEE

Text books:

1. Discrete Mathematics and Its Applications, Kenneth H. Rosen, 8th Edition, McGraw-Hill Education, 2019.
2. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, 9th Edition, Pearson Education, 2017.

Reference books / Manuals:

1. Discrete and Combinatorial Mathematics: An Applied Introduction, Ralph P. Grimaldi, 5th Edition, Pearson Education, 2004.
2. Discrete Mathematics, Seymour Lipschutz and Marc Lipson, Schaum's Outline Series, 3rd Edition, McGraw-Hill Education, 2009.
3. Introduction to Probability Models, Sheldon M. Ross, 12th Edition, Academic Press, 2019.
4. Probability, Statistics and Random Processes, T. Veerarajan, 4th Edition, McGraw-Hill Education, 2017.
5. Schaum's Outline of Probability and Statistics, Murray R. Spiegel, John Schiller and R. Alu Srinivasan, 4th Edition, McGraw-Hill Education, 2013.

Teaching -Learning– Evaluation Scheme:

Sl.No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching &Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours – Self Learning	-	-	-
4	Tutorial Component	1	14	14
5	Activity Based Learning (ABL1 & ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity1 2) Details of activity2	20
Total		**50**

Activity-Based Learning (ABL - 27Hours)

ABL 1 : Activity1 details (14 Hrs)
Hours

Writing Assignment with Problems on concerned to real world applications.	Submission of the final assignment report and evaluation.(Questions of blooms level L3 and Higher)	14

ABL 2 : Activity2 details (13 Hrs)

Problem Solving Assignment	Understand the input data requirements	1
	Formulate the methodology	4
	Design the solution	4

	Solving the problem and submission	4
Total		13

Course Outcomes	Program Outcomes[POs]											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3												
CO2		3											
CO3		2	1										

Course Title	Mathematics for VLSI		
Course Code	25MAVL301	(L-T-P) C	(3-0-0)3
Exam	3 hours	Hours/Week	3 hours
SEE	50 marks	Total Hours	42L + 48ABL = 90

Course Objective: To develop a strong foundation in signal analysis, Fourier series, Fourier transforms, Z-transforms, and optimization techniques essential for engineering applications. The course enables students to analyze continuous and discrete signals and apply mathematical tools for modeling, system analysis, and optimization problems relevant to VLSI and related engineering domains.

Course Outcomes(COs): Upon completion of the course, students shall be able to:

COs .	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the fundamentals of signals, mathematical operations, and Fourier series to analyze engineering problems.	1,2	-
2.	Analyze continuous and discrete-time signals using Fourier transforms, DFT, and FFT techniques.	1,2	-
3.	Apply Z-transform techniques to solve discrete-time system and signal analysis problems.	1,2	-
4.	Apply linear programming and optimization techniques to solve transportation and related engineering optimization problems.	1,2	-

Course Contents:

Module1	10 Hours

Mathematical Introduction to Signals in VLSI Engineering: Introduction to Signals, Classification of Signals, Elementary Signals and Basic Operations on signals, Mathematical Analysis and Derivations and related problems.

Fourier Series: Periodic functions, Euler's formula, Dirichlet's condition, Fourier series of functions - Even and odd functions. Practical harmonic analysis.

Self-Study: Half rang Fourier series.

Module2	10 Hours

Fourier Transforms: Infinite Fourier transform, Infinite Fourier sine and cosine transforms, Properties-Linear property, Change of scale, shifting property. Inverse transforms, Convolution theorem and its significance, Discrete Fourier transform (DFT), Fast Fourier transform (FFT).

Self-Study: Fourier transform of derivatives and integrals

Module3	10 Hours

Z-transform: Z-transform of Standard functions, Linearity property, Damping rule, Shifting property, Initial and final value theorems, Inverse Z-transform- Power series method, Partial fraction method.

Self-study: Inverse integral method

MODULE-4	12Hrs.

Optimization techniques: Introduction to optimization techniques, nature and characteristics of operation research. Introduction to Linear programming, graphical solution, solution by simplex and Big M Method.

Transportation problems: Introduction, Initial Basic feasible solution by North-West corner method, leastcost method, Vogel's approximation method.

Self-study: Formulation of assignment problems, Hungarian Method-Problems

Note: Theorems and properties without proofapplicable to all the modules.

Self-study is not included in SEE

Prescribed Textbooks:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Linear Algebra and its Applications	David C. Lay, Steven R Layand J.J. McDonald	5	Pearson Education Ltd	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Advanced Engineering Mathematics	E.Kreyszig	10	Wiley	2015
2.	Operations Research: An Introduction, Pearson Education.	Hamdy A. Taha,	4	Cenage publications	2014

eBooks and online course materials:

- https://www.geneseo.edu/~aguilar/public/assets/courses/233/main_notes.pdf

Online Courses and Video Lectures:

1. https://www.coursera.org/learn/introduction-to-linear-algebra
2. https://www.coursera.org/specializations/linear-algebra-elementary-to-advanced
3. NPTEL Courses on Engineering Mathematics
4. MIT Open Course Ware Mathematics
5. SWAYAM Online Courses

Teaching-Learning–Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching& Learning	3	14	42
3	Student Study Hours –Self Learning	1	14	14
4	Activity Based Learning(ABL1&ABL2)	-	-	27
5	Evaluation of Learning Process	-	-	07

Proposed Assessment Plan:

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each And reduced to 15marks	30
Assignment Details	Details of assignment to be conducted	20

Total	50

Activity Based Learning(27Hours)

ABL1(14Hours):Assignment 1 details		Hours
Writing Assignment with Problems on concerned to real world applications.	Submission of the final assignment report and evaluation.(Questions of Blooms level L3andHigher)	14
Total		**14**
ABL2(13Hours): Assignment 2 details		
Problem Solving Assignment	Understand the input data requirements	1
	Formulate the methodology	4
	Design the solution	4
	Solving the problem and submission	4
Total		**13**

Evaluation of Learning Process(7Hours)

Type of Evaluation	Hours
Test(1 and 2)	3
Assignment	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes[POs]												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2											
CO2	3	2											
CO3	3	1											
CO4	3	1											

Course Title	Bridge Course for Diploma Students BRIDGE COURSE MATHEMATICS - I (Common to all Branches of Engineering) (Audit Course)		
Course Code	25BCM301	L-T-P	(1-0-0)0
Exam	3 Hrs.	Hours/Week	3
CIE	100 Marks	Total Hours	14

Course Objective: Students will be able to use appropriate data structures for solving problems.

Course Outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Solve Engineering problems related to differentiation and integration	1	-
2	Analyze and solve Engineering problems related to vector differentiation	1&2	-
3	Model differential equations to Engineering problems and hence obtain the solution	1&2	-

MODULE-1	2 Hrs.

Differential Calculus: Basics of differentiation, Polar curves, Radius of curvature and illustrative examples.

MODULE-2	3 Hrs.

Partial Differentiation: Partial derivatives, Total derivatives and illustrative examples.

MODULE-3	3Hrs.

Integral Calculus: Multiple integrals (double and triple integrals) and illustrative examples.

MODULE-4	3 Hrs.

Vector Differentiation: Gradient, Divergence, Curl and illustrative examples.

MODULE-5	3 Hrs.

Ordinary Differential Equations (ODEs): Solutions of first-order and first-degree differential equations: Exact, Linear and Bernoulli's differential equations.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
01	Higher Engineering Mathematics	Dr.B.S.Grewal	40th edition	Khanna Publications	2007
02	Advanced Engineering Mathematics	Erwin Kreyszig	8th edition	TataMcGrawHill, Publications	2007

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
01	Calculus	Thomas Finney	9th edition	Pearson education	2002
02	A text book of Engineering Mathematics	N.P. Baliand Manish Goyal	Reprint	Laxmi Publications	2010

Teaching - Learning - Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	1	14	14
2	Integrated Lab Component	0	0	00
3	Student Study Hours - Self Learning	1	10	10
3	Activity Based Learning (ABL1 & ABL2)	-	-	-
4	Evaluation of Learning Process	-	-	04
Total Learning Hours/Semester				**28**

Proposed Assessment Plan (for 50marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each	100
Total		**100**

Evaluation of Learning Process (4Hours)

Type of Evaluation	Hours

Test (1, 2)	2
Activity (1 and 2)	0
Semester End Exam	3
Total	**5**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	1												
CO2	1	1											
CO3	1	1											

Course Title	Bridge Course for Diploma Students BRIDGE COURSE MATHEMATICS - II (Common to all Branches of Engineering) (Audit Course)		
Course Code	**25BCM401**	**L-T-P**	**(1-0-0)0**
Exam	**3 Hrs.**	**Hours/Week**	**1**
SEE	**100 Marks**	**Total Hours**	**14**

Course Objective: Students will be able to use appropriate data structures for solving problems.

Course Outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Identify suitable methods to solve the differential equations analytically and Transcendental equations Numerically	1&2	-
2	Find Laplace transforms of Ordinary, Periodic and Unit step function	1	-
3	Analyze and solve Engineering problems related to Probability and statistics.	1&2	-

MODULE-1	3 Hrs.

Linear Differential Equations - Higher-order ODEs with constant coefficients: Exponential, trigonometry (sine and cosine only) and polynomial.

MODULE-2	3 Hrs.

Laplace Transforms - Definitions, properties, periodic functions and unit-step functions.

MODULE-3	3 Hrs.

Probability - Basic probability, addition and multiplication rules, and Bayes' theorem.

MODULE-4	2Hrs.

Statistics - Curve fitting, correlation, and regression.

MODULE-5	3 Hrs.
Numerical Methods - Solutions of algebraic and transcendental equations using numerical methods like Regula-Falsi and Newton-Raphson**.**	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
01	Higher Engineering Mathematics	Dr.B.S.Grewal	40	Khanna Publications	2007
02	Advanced Engineering Mathematics	Erwin Kreyszig	8	TataMcGrawHill, Publications	2007

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
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02	A text book of Engineering Mathematics	N.P. Baliand Manish Goyal	Reprint	Laxmi Publications	2010

Teaching - Learning - Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	1	14	14
2	Integrated Lab Component	0	0	00
3	Student Study Hours - Self Learning	1	10	10
3	Activity Based Learning (ABL1 & ABL2)	-	-	-
4	Evaluation of Learning Process	-	-	04
Total Learning Hours/Semester				**28**

Proposed Assessment Plan (for 50marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each	100
Total		**100**

Evaluation of Learning Process (4Hours)

Type of Evaluation	Hours
Test (1, 2)	2
Activity (1 and 2)	0
Semester End Exam	3
Total	**5**

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO 1**	**PO2**	**PO 3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO9**	**PO 10**	**PO 1 1**	**PSO 1**	**PSO 2**
CO1	1	1											
CO2	1												
CO3	1	1											