MABS2001: Engineering Mathematics-III (For Civil/Mechanical)		
Teaching Scheme	**Examination Scheme**	
Lectures: 02 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 01 hrs/ week	**ISE II**	**15 Marks**
Credits: 03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course description:

MABS 2001:Engineering Mathematics-III is a compulsory course to Second Year engineering students of Civil and Mechanical of the institute in the Semester –III and is a continuation of previous year courses viz. MABS1001: Engineering Mathematics-I and MABS1002: Engineering Mathematics-II. This course intends to provide engineering students a coherent and balanced account of major mathematical techniques and tools.

Course Objective:

This course intends to provide an overview of analytical and numerical techniques to solve ordinary and partial differential equations, which we apply to solve many engineering problems.

Course Outcomes:

After completing the course, students will be able to:

CO1	Define linear differential equations (LDE), Cauchy's and Legendre's differential equations, first order partial differential equations, Lagrange's equation
CO2	Summaries the solution of LDE with constant and variable coefficients, solution of homogeneous and non-homogeneous PDE,
CO3	Find approximate solution of ordinary differential equations of first order
CO4	Solve linear differential equations with constant and variable coefficients, first order linear and non linear partial differential equations, second order homogeneous and non homogeneous linear partial differential equations.
CO5	Apply knowledge of linear differential equations to civil engineering problems, spring-mass system, apply knowledge of partial differential equations to wave equations and heat equations.

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Detailed syllabus:

Unit-I	**The approximation for the solution of first order Ordinary Differential Equations:** Taylor series method, Euler's method, Euler's modified Method, Runge-Kutta Fourth order Method, Milne's Predictor-Corrector Method.
Unit-II	**Linear Differential Equations (LDE):** Linear differential equations **(LDE)** with constant coefficients, method of variation of parameters second order linear differential equations with variable coefficients, Cauchy's and Legendre's differential equations.
Unit-III	**Applications of Linear Differential Equations (LDE):** Bending of beams, spring-mass system.
Unit-IV	**Partial Differential Equations (PDE):** First order linear/nonlinear partial differential equation, Lagrange's equation, solution to homogenous and non-homogenous linear partial differential equations of second and higher order by complimentary function and particular integral method.
Unit-V	**Applications of Partial Differential Equations:** Method of separation of Variables, solutions of one-dimensional wave equation, one-dimensional heat equation, steady state solution of two-dimensional heat equation.

Text and Reference Books

1. E. Kreyszig, *Advanced Engineering Mathematics*, 9th edition, New Delhi, John Willey Eastern Ltd. 2006.
2. B.S. Grewal, *Higher Engineering Mathematics* 44th edition, New Delhi, Khanna publication, 2017.
3. R. R Singh, Mukul Bhatt, *Engineering Mathematics-A Tutorial Approach* , 1st edition, New Delhi, McGraw Hill Education India Publication, 2013.
4. H.K Dass, *Advanced Engineering Mathematics* , 22nd edition, New Delhi, S. Chand and Sons Publication, 2018..
5. G. B. Thomas and R. L. Finney , *Calculus* , 12th edition, Boston, Addison- Wesley, 2010.
6. I.N. Sneddon, *Elements of Partial Differential Equations*, 5th edition, Dover Publications inc network. 2013.
7. W.E. Boyce & R.C. Di-Prima, *Elementary Differential Equations and Boundary Value Problems*, 9th edition, New Delhi, John Willey and Sons ltd Publication, 2009.

Mapping of Course outcome with Program Outcomes (Civil & Mechanical Engineering)

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1										1
CO2	3	1										1
CO3	3	2	1									1
CO4	3	2										1
CO5	3	2										1

3 – High, 2 – Medium, 1 - Low

Approved In XXIV th Academic Council, Dated 23/07/2022

Teaching Strategies:

The teaching strategy planned through the lectures, and team based home works. Exercises assigned weekly to stimulate the students to actively use and revise the learned concepts, which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes emphasized

Assessment: ISE-I, ISE-II, ISE-III (Class Test-1, Class Test-2, TA) & ESE
TA: Students will perform one or more of the following activities

1. Surprise Test
2. Assignment using Mathematical tools like Mathematica/ MatLab or similar.
3. Quiz
4. Any other activity suggested by course coordinator

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I (Class Test-1)	ISE II (Class Test-2)	ISE III (TA + Surprise Test)	End Semester Examination	Total
K1	Remember	01	02			03
K2	Understand	14	13	10	44	81
K3	Apply				16	16
K4	Analyze					
K5	Evaluate					
K6	Create					
Total Marks 100		15	15	10	60	**100**

Assessment table:

Assessment Tool	K1	K2	K2	K2	K3	Total
	CO1	CO2	CO3	CO4	CO5	
ISE I (15 Marks)	01		08	06		15
ISE II (15 Marks)	02			08	05	15
ISE III (10 Marks)		04	02		04	10
ESE Assessment (60 Marks)			15	29	16	60
Total Marks 100	03	04	25	43	25	**100**

MABS 2002: Engineering Mathematics-III (For EEP/IT)		
Teaching Scheme	**Examination Scheme**	
Lectures: 02 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 01 hrs/ week	**ISE II**	**15 Marks**
Credits: 03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course description:

MABS 2002: Engineering Mathematics-III is a compulsory course to second year engineering students of EEP and IT of the institute in the Semester –III and is a continuation of previous year courses viz. MABS1001:Engineering Mathematics-I and MABS1002:Engineering Mathematics-II . This course intends to provide engineering students a coherent and balanced account of major mathematical techniques and tools.

Course Objective:

This course intends to provide an overview of analytical techniques to solve ordinary and partial differential equations and introduce different integral transforms i.e. laplace transform, fourier transform and Z- Transform, which we apply to solve many engineering problems.

Course Outcomes:

After completing the course, students will be able to:

CO1	Define linear differential equations (LDE), Cauchy's and Legendre's differential equations, first order partial differential equations, lagrange's equation, laplace transform, fourier transform and Z-Transform, region of convergence.
CO2	Summaries the solution of LDE with constant and variable coefficients, solution of homogeneous and non-homogeneous PDE, Properties of laplace transform, fourier transform and Z-Transform.
CO3	Find laplace transform of derivative and integration, inverse laplace transform using properties, partial fraction method and convolution theorem, fourier transform of periodic functions, Z-transform of discrete functions, inverse fourier transform and inverse Z-transform.
CO4	Solve linear differential equations with constant and variable coefficients, first order linear and non linear partial differential equations, second order homogeneous and non homogeneous linear partial differential equations.

S. U. Sapkal

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Detailed syllabus:

Unit-I	**Linear Differential Equations (LDE):** Linear differential equations **(LDE)** with constant coefficients, method of variation of parameters, second order linear differential equations with variable coefficients, Cauchy's and Legendre's differential equations.
Unit-II	**Partial Differential Equations (PDE):** First order linear/nonlinear partial differential equation, Lagrange's equation. solution to homogenous and non-homogenous linear partial differential equations of second and higher order by complimentary function and particular integral method.
Unit-III	**Laplace Transform (LT):** Definition of laplace transform, properties of laplace transform, laplace transform of elementary functions, laplace transform of derivative of functions, laplace transform of integration of functions, laplace transform of periodic functions, inverse laplace transform using definition, properties and partial fraction, convolution theorem.
Unit-IV	**Fourier Transform (FT):** Fourier integral theorem, fourier sine and cosine integrals, fourier transform pair, fourier sine and cosine transform pairs, properties of fourier transform, fourier transform of simple functions, convolution theorem.
Unit-V	**Z Transform:** Z transform of elementary functions, region of convergence, properties and theorems of Z transform, inverse of Z transform using convolution theorem, partial fraction method, inversion integral method.

Text and Reference Books

1. E. Kreyszig, *Advanced Engineering Mathematics*, 9th edition, New Delhi, John Willey Eastern Ltd. 2006.
2. B.S. Grewal, *Higher Engineering Mathematics* 44th edition, New Delhi, Khanna publication, 2017.
3. R. R Singh, Mukul Bhatt, *Engineering Mathematics-A Tutorial Approach* , 1st edition, New Delhi, McGraw Hill Education India Publication, 2013.
4. H.K Dass, *Advanced Engineering Mathematics* , 22nd edition, New Delhi, S. Chand and Sons Publication, 2018..
5. G. B. Thomas and R. L. Finney, *Calculus*, 12th edition, Boston, Addison- Wesley, 2010.
6. I.N. Sneddon, *Elements of Partial Differential Equations*, 5th edition, Dover Publications inc network. 2013.
7. W.E.Boyce & R.C.Di-Prima, *Elementary Differential Equations and Boundary Value Problems*, 9th edition, New Delhi, John Willey and Sons ltd Publication, 2009.

Mapping of Course outcome with Program Outcomes (Electrical Engineering & Information Technology)

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1										1
CO2	3	1										1
CO3	3	2	1									1
CO4	3	2										1

3 – High, 2 – Medium, 1– Low

Approved in XXIV[th] Academic Council,Dated 23/07/2022

Teaching Strategies:

The teaching strategy planned through the lectures, and team based home works. Exercises assigned weekly to stimulate the students to actively use and revise the learned concepts, which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes emphasized

Assessment: ISE I, ISE II, ISE III (Class Test-1, Class Test-2, TA) & ESE
TA: Students will perform one or more of the following activities

1. Surprise Test
2. Assignment using Mathematical tools like Mathematica/MatLab or similar.
3. Quiz
4. Any other activity suggested by course coordinator

Assessment Pattern Level No.	**Knowledge Level**	**ISE I (Class Test-1)**	**ISE II (Class Test-2)**	**ISE III (TA + Surprise Test)**	**End Semester Examination**	**Total**
K1	Remember	03	03			06
K2	Understand	12	12	10	60	94
K3	Apply					
K4	Analyze					
K5	Evaluate					
K6	Create					
Total Marks 100		15	15	10	60	**100**

Assessment table:

Assessment Tool	K1	K2	K2	K2	Total
	CO1	CO2	CO3	CO4	
ISE I (15 Marks)	03			12	15
ISE II (15 Marks)	03		12		15
ISE III (10 Marks)		10			10
ESE Assessment (60 Marks)			30	30	60
Total Marks 100	06	10	42	42	**100**

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MABS2004: Engineering Mathematics-III (For E&TC/CSE)		
Teaching Scheme	**Examination Scheme**	
Lectures: 02 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 01 hrs/ week	**ISE II**	**15 Marks**
Credits: 03	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Perquisites: Nil

Course Description:

MABS 2004: Engineering Mathematics-III is a compulsory course to Second Year engineering students of E&TC and CSE of the institute in the Semester –III and is a continuation of previous year courses viz. MABS1001: Engineering Mathematics-I and MABS1002: Engineering Mathematics-II. The course aims to equip the students with statistical tools and concepts that help in decision-making. This course is intended to provide Engineering students a coherent and balanced account of probability and statistics that form the basis of many engineering analytical tools.

Course objectives:

1. To create interest in students in statistical thinking.
2. To understand, analyze, and solve problems on random variables statistics, significance testing and goodness of fit tests for probability distributions.

Course Outcomes:

After completing the course, students will be able to

CO1	Define the basic concepts of probability distributions, random variable and sampling
CO2	Explain the concepts of random variable, probability distributions and population parameters of large or small size sample
CO3	Apply the regression techniques (least square method) and correlation techniques to the sample data, testing hypothesis for small and large samples
CO4	Compute and interpret the results of Bi-variate regression and correlation analysis, for forecasting
CO5	to apply non-parametric tests for significance testing and goodness of fit of the probability distribution

Detailed Syllabus:

Unit-I	**Basic Statistics:** Measures of central tendency, dispersion, moments, skewness and kurtosis, correlation coefficient, lines of regression, curve fitting, method of least square, straight lines, second degree parabola, exponential and power curves.
Unit-II	**Random Variables:** Random variable, discrete random variables, continuous random variables, definition of distribution and types of distribution: p.d.f, p.m.f, c.d.f. of random variables, characteristic function of random variables, univariate and bivariate distribution and its marginal distribution.
Unit-III	**Mathematical Expectations:** Mathematical expectation: definition and properties, mean, variance, standard deviation in terms of expectations, moment generating function, characteristics function.
Unit-IV	**Probability distribution:** Binomial distribution, Poisson distribution, Normal

	distribution, Chi-square distribution and Student's t distribution.
Unit-V	**Sampling and Tests of Significance**: Basic concepts sampling and its type (simple random, stratified and cluster), its needs; types of hypothesis, types of error, critical region; level of significance. procedure of testing hypothesis, test of significance: large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations, test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Text and Reference Books :

1. S.C. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics*, 10th edition, New Delhi, S. Chand & Sons Publications, 2002.
2. S.C. Gupta , *Fundamentals of Statistics*, 7th edition, New Delhi, Himalaya Publishing House, 2021.
3. E. Kreyszig, *Advanced Engineering Mathematics*, 9th edition, New Delhi, John Willey Eastern Ltd. 2006.
4. B.S. Grewal, *Higher Engineering Mathematics* 44th edition, New Delhi, Khanna publication, 2017.
5. N.P. Bali and M. Goyal, *A text book of Engineering Mathematics*, 9th edition, New Delhi, Laxmi Publications pvt. ltd, 2014.
6. Ross, S.M., *Introduction to Probability and Statistics for Engineers and Scientists*, 5th edition, New Delhi, Elsevier Publication, 2004.

Mapping of Course outcome with Program Outcomes
(Electronics and Telecommunication Engineering & Computer Science Engineering)

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		2								1
CO2	3	2		2								1
CO3	3	2		2	2							1
CO4	3	3		3								1
CO5	3	3		3								1

3 – High, 2 – Medium, 1 – Low

Approved in XXIVth Academic Council,Dated 23/07/2022

Teaching Strategies:

The teaching strategy planned through the lectures, and team based home works. Exercises assigned weekly to stimulate the students to actively use and revise the learned concepts, which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes emphasized

Assessment: ISE-I, ISE-II, ISE-III (Class Test-1, Class Test-2, TA) & ESE
TA: Students will perform one or more of the following activities

1. Surprise Test
2. Assignment using Mathematical tools like Mathematica / MatLab or similar.
3. Quiz
4. Any other activity suggested by course coordinator

Assessment Pattern:

Assessment Pattern Level No.	Knowledge Level	ISE I (Class Test-1)	ISE II (Class Test-2)	ISE III (TA + Surprise Test)	End Semester Examination	Total
K1	Remember	03	03			06
K2	Understand	08	12	10	40	70
K3	Apply	04			20	24
K4	Analyze					
K5	Evaluate					
K6	Create					
Total Marks 100		15	15	10	60	**100**

Assessment table:

Assessment Tool	K1	K2	K3	K2	K3	Total
	CO1	CO2	CO3	CO4	CO5	
ISE I (15 Marks)	03	04	04	04		15
ISE II (15 Marks)	03	12				15
ISE III (10 Marks)		04		06		10
ESE Assessment (60 Marks)	14	04	16	10	16	60
Total Marks 100	20	24	20	20	16	**100**

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MABS 2011: Engineering Mathematics-IV (For E&TC)		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 01 hrs/ week	**ISE II**	**15 Marks**
Credits: 04	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Course description:

MABS 2011: Engineering Mathematics-IV is a compulsory course to second year engineering students of E&TC of the institute in the semester –IV. This course intends to provide engineering students a coherent and balanced account of major mathematical techniques and tools.

Course Objective:

This course intends to provide an overview of analytical and numerical techniques to solve ordinary and partial differential equations, which we apply to solve many engineering problems.

Course Outcomes:

After completing the course, students will be able to:

CO1	Define linear differential equations (LDE), Cauchy's and Legendre's differential equations, first order partial differential equations, Lagrange's equation, analytic function, harmonic function, singularities, residues, vector spaces, subspaces, basis, linear transformation. eigen values, eigen vectors.
CO2	Summaries the solution of LDE with constant and variable coefficients, solution of homogeneous and non-homogeneous PDE, differentiation and integration of vector point functions, complex derivatives.
CO3	Identify analytic function, harmonic function, Cauchy-Reimann equations.
CO4	Find line integral, surface integral, volume integral, and residues, matrix associated with a linear map, range and kernel of LT, inverse of LT. symmetric, skew-symmetric, and orthogonal matrices, orthogonal basis by using Gram-Schmidt orthogonalization.
CO5	Solve linear differential equations with constant and variable coefficients, first order linear and non linear partial differential equations, second order homogeneous and non homogeneous linear partial differential equations, complex integrals by using Cauchy's integral formula and residue theorem.

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Detailed Syllabus:

Unit-I	**Linear Differential Equations (LDE)** Linear differential equations (LDE) with constant coefficients, method of variation of parameters, second order linear differential equations with variable coefficients, Cauchy's and Legendre's differential equations.
Unit-II	**Partial Differential Equations (PDE)** First order linear/nonlinear partial differential equation, lagrange's equation, solution to homogenous and non-homogenous linear partial differential equations of second and higher order by complimentary function and particular integral method.
Unit-III	**Vector Integral Calculus** Review of vector differentiation, line integral, work done in a force field, surface integral, volume integral, Green's theorem, Stoke's theorem, Guass-divergence theorem.
Unit-IV	**Functions of Complex Variable** Limit continuity and differentiation of complex variable, analytic function, harmonic function, Cauchy-Reimann equations, Cauchy's integral theorem, Cauchy's integral formula, singularities, residues, residue theorem.
Unit-V	**Linear Algebra** Vector space, linear dependence of vectors, basis, dimension; linear transformations (maps), range and kernel of a linear map, rank and nullity, inverse of a linear transformation, rank-nullity theorem, composition of linear maps, matrix associated with a linear map, eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal matrices, eigen bases. diagonalization; inner product spaces, Gram-Schmidt orthogonalization.

Text and Reference Books:-

1. E. Kreyszig, *Advanced Engineering Mathematics*, 9th edition, New Delhi, John Willey Eastern Ltd. 2006.
2. B. S. Grewal , *Higher Engineering Mathematics*, 44th edition, New Delhi, Khanna publication, 2017.
3. N.P. Bali and M. Goyal, *A Text Book of Engineering Mathematics,* 9th edition, New Delhi, Lakshmi Publications Pvt. Ltd, 2014.
4. B.V. Ramana, *Higher Engineering Mathematics*, 31st edition, Chennai, Tata McGraw Hill Pvt. Ltd., 2017.
5. H. K. Dass , *Advanced Engineering Mathematics*, 22nd edition, New Delhi, S. Chand and Sons publication, 2018.
6. R. R. Singh, M. Bhatt, *Engineering Mathematics-A Tutorial Approach* , 1st edition, New Delhi, Mc Graw Hill Education India publication, 2013.
7. W.E. Boyce & R. C. DiPrima, *Elementary Differential Equations and Boundary Value Problems.* 9th edition, New Delhi, John Willey Eastern Ltd. 2009.

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Mapping of Course outcome with Program Outcomes (Electronics and Telecommunication Engineering)

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		2								2
CO2	3	2		2								2
CO3	3	2		2								2
CO4	3	2	2	2								2
CO5	3	2	2	2								2

3 – High, 2 – Medium, 1 - Low

Teaching Strategies:

The teaching strategy planned through the lectures, and team based home works. Exercises assigned weekly to stimulate the students to actively use and revise the learned concepts, which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes emphasized

Assessment: ISE-I, ISE-II, ISE-III (Class Test-1, Class Test-2, TA) & ESE

TA: Students will perform one or more of the following activities

1. Surprise Test
2. Assignment using Mathematical tools like Mathematica / MatLab or similar.
3. Quiz
4. Any other activity suggested by course coordinator

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I (Class Test-1)**	**ISE II (Class Test-2)**	**ISE III (TA + Surprise Test)**	**End Semester Examination**	**Total**
K1	Remember	03	03			06
K2	Understand	12	12	10	60	94
K3	Apply					
K4	Analyze					
K5	Evaluate					
K6	Create					
Total Marks 100		15	15	10	60	**100**

Assessment table:

Assessment Tool	K1	K2	K2	K2	K2	Total
	CO1	CO2	CO3	CO4	CO5	
ISE I (15 Marks)	03	06			06	15
ISE II (15 Marks)	03	04	04	04		15
ISE III (10 Marks)		02	02	02	04	10
ESE Assessment (60 Marks)		15	15	15	15	60
Total Marks 100	06	27	21	21	25	**100**

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MABS 2012: Engineering Mathematics-IV (For IT)		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Tutorial: 01 hrs/ week	**ISE II**	**15 Marks**
Credits: 04	**ISE III**	**10 Marks**
	End Semester Examination	**60 Marks**

Perquisites: Nil

Course Description:

MABS 2012: Engineering Mathematics-IV is a compulsory course for Second Year IT students of the institute. The course aims to equip the students with statistical tools and concepts that help in decision-making. This course is intended to provide engineering students a coherent and balanced account of probability and statistics that form the basis of many engineering analysis tools. This course gives exposure on vector spaces and linear mapping.

Course objectives:

1. To create interest in students in statistical thinking.
2. To understand, analyze, and solve problems on random variables statistics, significance testing and goodness of fit tests for probability distributions
3. To understand vector spaces
4. To understand concepts of linear mapping and orthogonality.

Course Outcomes expected:

After completing the course, students will be able to:

CO1	Define the basic concepts of probability distributions, random variable and sampling. vector spaces, subspaces, basis, linear transformation. eigen values, eigen vectors,
CO2	Explain the concepts of random variable, probability distributions and population parameters of large or small size sample, range and kernel of LT, inverse of LT. symmetric, skew-symmetric, and orthogonal matrices. Gram-Schmidt orthogonalization.
CO3	Find lines of regression, best fit of curve by least square methods, probability by using Binomial distribution, Poisson distribution, Normal distribution, variance, standard deviation in terms of expectations, matrix associated with a linear map.
CO4	Compute and interpret the results of Bi-variate regression and correlation analysis, for forecasting
CO5	Apply the regression techniques (least square method) and correlation techniques to the sample data, testing hypothesis for small and large samples, non-parametric tests for significance testing and goodness of fit of the probability distribution, Gram-Schmidt orthogonalization to find orthogonal basis.

Detailed Syllabus:

Unit-I	**Basic Statistics:** Measures of central tendency, dispersion, moments, skewness and kurtosis, correlation coefficient, lines of regression, curve fitting, method of least square, straight lines, second degree parabola, exponential and power curves. Binomial distribution, Poisson distribution, Normal distribution.
Unit-II	**Random Variables:** Random variable, discrete random variables, continuous random variables, definition of distribution and types of distribution: p.d.f, p.m.f, c.d.f. of random variables, characteristic function of random variables, univariate and bivariate distribution and its marginal distribution.

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	Mathematical Expectations: Mathematical expectation: definition and properties, mean, variance, standard deviation in terms of expectations, moment generating function, characteristics function.
Unit-III	**Sampling and Tests of Significance**: Basic concepts sampling and its type (simple random, stratified and cluster), its needs; types of hypothesis, types of error, critical region; level of significance, procedure of testing hypothesis, Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations. Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.
Unit-IV	**Linear Algebra-I:** Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, inverse of a linear transformation, rank-nullity theorem, composition of linear maps, matrix associated with a linear map.
Unit-V	**Linear Algebra-II:** Eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal matrices, eigen bases, diagonalization; inner product spaces, Gram-Schmidt orthogonalization.

Text and Reference Books:

1. S.C. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics*, 10th edition, New Delhi, S. Chand & Sons Publications, 2002.
2. S.C. Gupta , *Fundamentals of Statistics*, 7th edition, New Delhi, Himalaya Publishing House, 2021.
3. E. Kreyszig, *Advanced Engineering Mathematics*, 9th edition, New Delhi, John Wiley Eastern Ltd. , 2006.
4. N.P. Bali and Manish Goyal, *A text book of Engineering Mathematics*, 9th edition, New Delhi, Laxmi Publications Pvt. Ltd.2014.
5. B.S. Grewal, *Higher Engineering Mathematics*, 44th edition, New Delhi, Khanna Publishers,2017.
6. S.M. Ross, *Introduction to Probability and Statistics for Engineers and Scientists*, 5th edition, New Delhi, Elsevier Publications, 2004.

S.U. Shinde

Approved in XXIVth Academic Council, Dated 23/07/2022

Mapping of Course outcome with Program Outcomes (Information Technology)

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										2
CO2	3	2		1								2
CO3	3	2	1	2								2
CO4	3	2	2	2								2
CO5	3	2	2	3								2

3 – High, 2 – Medium, 1 – Low

Teaching Strategies:

The teaching strategy planned through the lectures, and team based home works. Exercises assigned weekly to stimulate the students to actively use and revise the learned concepts, which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes emphasized

Assessment: ISE-I, ISE-II, ISE-III (Class Test-1, Class Test-2, TA) & ESE
TA: Students will perform one or more of the following activities

1. Surprise Test
2. Assignment using Mathematical tools like Mathematica/MatLab or similar.
3. Quiz
4. Any other activity suggested by course coordinator

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**ISE I (Class Test-1)**	**ISE II (Class Test-2)**	**ISE III (TA + Surprise Test)**	**End Semester Examination**	**Total**
K1	Remember	03	03			04
K2	Understand	12	12	10	30	66
K3	Apply				30	30
K4	Analyze					
K5	Evaluate					
K6	Create					
Total Marks 100		15	15	10	60	**100**

Assessment table:

Assessment Tool	K1	K2	K2	K2	K3	Total
	CO1	CO2	CO3	CO4	CO5	
ISE I (15 Marks)	03	12				15
ISE II (15 Marks)	03	06	06			15
ISE III (10 Marks)		03	03	04		10
ESE Assessment (60 Marks)		10	10	10	30	60
Total Marks 100	06	31	19	14	30	**100**

Approved in XXIVth Academic Council,Dated 23/07/2022