BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

LINEAR ALGEBRA AND ORDINATRY DIFFERENTIAL EQUATIONS
I B. Tech. I Semester 20CE101/MA01

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors
➢	Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order ordinary differential equations.
➢	Create and analyze mathematical models using higher order differential equations to solve application problems that arise in engineering.
➢	Solve a linear differential equation with constant coefficients with the given initial conditions using Laplace Transforms.

Course Outcomes: After studying this course, the students will be able to

CO-1	Find the eigen values and eigen vectors of a given matrix and its inverse.
CO-2	Apply the appropriate analytical technique to find the solution of a first order ordinary differential equation.
CO-3	Solve higher order linear differential equations with constant coefficients arise in engineering applications.
CO-4	Apply Laplace transforms to solve differential equations arising in engineering

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO-1	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-	-
CO-2	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
CO-3	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
CO-4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-

UNIT-1 (12 Hours)

Linear Algebra: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse; Consistency of linear System of equations: Rouches theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values(without proofs); Cayley-Hamilton theorem (without proof).
[Sections: 2.7.1; 2.7.2; 2.7.6; 2.10.1; 2.10.2; 2.10.3; 2.12.1; 2.13.1; 2.14; 2.15.]

UNIT-2

	(12 Hours)

Differential Equations of first order: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree; variables separable; Linear Equations; Bernoulli's equation; Exact Differential equations; Equations reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the equation M dx+ N dy = 0, $\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}$ is a function of x and $\frac{\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}}{M}$ is a function of y.

Applications of a first order Differential equations: Newton's law of cooling; Rate of decay of Radio-active materials.

[Sections: 11.1; 11.3; 11.4; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2; 11.12.4; 12.6; 12.8]

UNIT-3	(12 Hours)

Linear Differential Equations: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working procedure to solve the equation; Method of Variation of Parameters; Applications of Linear Differential Equations: Oscillatory Electrical Circuits.

[Sections: 13.1; 13.2.1; 13.3; 13.4; 13.5; 13.6; 13.7;13.8.1;14.1;14.5].

UNIT-4	(12 Hours)

Laplace Transforms: Definition; conditions for the existence; Transforms of elementary functions; properties of Laplace Transforms; Transforms of derivatives; Transforms of integrals; Multiplication by t^n; Division by t; Inverse transforms- Method of partial fractions; Other methods of finding inverse transforms; Convolution theorem(without proof); Application to differential equations: Solution of ODE with constant coefficients using Laplace transforms.

[Sections:21.2.1; 21.2.2; 21.3; 21.4; 21.7; 21.8; 21.9; 21.10; 21.12; 21.13; 21.14; 21.15.1]

Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

NUMERICAL METHODS AND ADVANCED CALCULUS
I B. Tech. II Semester 20CE201/MA02

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve algebraic, transcendental and system of linear equations with the help of numerical methods.
➢	Apply the techniques of numerical integration whenever and wherever routine methods are not applicable and solve the first order ordinary differential equations numerically with the given initial condition using different methods.
➢	Evaluate double and triple integrals and apply them to find areas and volumes.
➢	Evaluate the line, surface and volume integrals and learn their inter-relations and applications.

Course Outcomes: After studying this course, the students will be able to

CO-1	Solve non-linear equations and system of linear equations with the help of Numerical techniques.
CO-2	Solve the first order ordinary differential equations numerically with the given initial condition.
CO-3	Find the area and volume of plane and three dimensional figures using multiple integrals.
CO-4	Apply vector integral theorems to obtain the solutions of engineering problems involving circulation, flux, and divergence in vector fields.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO-1	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-	-
CO-4	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-	-

UNIT-1 (12 Hours)

Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi's iterative method, Gauss-Seidel iterative method.
[Sections:28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2].

UNIT-2

	(12 Hours)
Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton's interpolation formulae: Newton's forward interpolation formula, Newton's backward interpolation formula; Interpolation with unequal intervals; Lagrange's interpolation formula; Divided differences; Newton's divided difference formula; Numerical integration; Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Numerical solution of ODE's: Introduction; Picard's method; Euler's method; Runge-Kutta method. [Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.2; 32.4; 32.7].	
UNIT-3	(12 Hours)
Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integral, Change of variables. [Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2].	
UNIT-4	(12 Hours)
Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green's theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem(without proof). [Sections: 8.4; 8.5; 8.5.1; 8.5.3; 8.6; 8.11.1; 8.12.2; 8.12.3; 8.13; 8.14; 8.16]	
Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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PROBABILITY AND STATISTICS
II B. Tech. III Semester 20CE301/MA03

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Apply the continuous probability densities to various problems in science and engineering.
➢	Estimate the point and interval estimators of the mean, variance and proportion for the given Sample data and apply Z-test, t-test to various real-life problems
➢	Apply various sample tests like F-test and $\chi 2$ -test for decision making regarding the population based on sample data.
➢	Compute the level of correlation, the best fit curve to the given data by the method of least squares and also perform ANOVA arising in the field of engineering.

Course Outcomes: After studying this course, the students will be able to

CO-1	Apply discrete and continuous probability distributions to various problems arising in Engineering applications.
CO-2	Perform Test of Hypothesis for a population parameter for single sample.
CO-3	Perform Test of Hypothesis for population parameters for multiple samples.
CO-4	Interpret the results of correlation, regression and one way ANOVA for the given data.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO-1	3	3	-	-	-	-	-	-	-	-	-	2	3	-		-
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	2	-		-
CO-3	3	3	2	-	-	-	-	-	-	-	-	2	2	-		-
CO-4	3	3	3	-	-	-	-	-	-	-	-	2	2	-		-

UNIT-1
(12 Hours)

Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Gamma Distribution and its applications, Beta Distribution and its applications, Weibull distribution, Joint Distributions (Discrete), Joint Distributions (Continuous).
(Sections 5.1, 5.2, 5.3, 5.5,5.7, 5.8, 5.9, 5.10)

UNIT-2

	(12 Hours)
Populations and Samples, The sampling distribution of the mean (σ known), The sampling distribution of the mean (σ unknown), The sampling distribution of the variance, Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of hypotheses, Hypothesis concerning one mean. (Sections 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.4, 7.5, 7.6)	
UNIT-3	(12 Hours)
Comparisons-Two independent Large samples, Comparisons-Two independent small samples, matched pairs comparisons, The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances. (Sections 8.2, 8.3, 8.4, 9.1, 9.2, 9.3) .	
UNIT-4	(12 Hours)
Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions. The method of least squares, curvilinear regression, multiple regression, correlation, Completely Randomized Designs. (10.1, 10.2, 10.3, 11.1, 11.3, 11.4, 11.6, 12.1, 12.2)	
Text Books :	Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson, 8th Edition, PHI.
References :	1. R.E Walpole, R.H. Myers & S.L. Myers 'Probability & Statistics for Engineers and Scientists', 6th Edition, PHI. 2. Murray R Spiegel, John J.Schiller, R. AluSrinivasa, 'Probability &Satistics', Schaum's outline series.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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LINEAR ALGEBRA AND ORDINATRY DIFFERENTIAL EQUATIONS
I B. Tech. I Semester 20CS101/MA01

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors
➢	Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order ordinary differential equations.
➢	Create and analyze mathematical models using higher order differential equations to solve application problems that arise in engineering.
➢	Solve a linear differential equation with constant coefficients with the given initial conditions using Laplace Transforms.

Course Outcomes: After studying this course, the students will be able to

CO-1	Find the eigen values and eigen vectors of a given matrix and its inverse.
CO-2	Apply the appropriate analytical technique to find the solution of a first order ordinary differential equation.
CO-3	Solve higher order linear differential equations with constant coefficients arise in engineering applications.
CO-4	Apply Laplace transforms to solve differential equations arising in engineering

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-
CO-2	3	3	3	-	-	-	-	-	-	-	-	2	-	2	-
CO-3	3	3	3	-	-	-	-	-	-	-	-	2	-	2	-
CO-4	3	3	3	-	-	-	-	-	-	-	-	2	-	2	-

UNIT-1 (12 Hours)

Linear Algebra: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse; Consistency of linear System of equations: Rouches theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values(without proofs); Cayley-Hamilton theorem (without proof).

[Sections: 2.7.1; 2.7.2; 2.7.6; 2.10.1; 2.10.2; 2.10.3; 2.12.1; 2.13.1; 2.14; 2.15.]

UNIT-2

	(12 Hours)

Differential Equations of first order: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree; variables separable; Linear Equations; Bernoulli's equation; Exact Differential equations; Equations reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the equation M dx+ N dy = 0, $\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}$ is a function of x and $\frac{\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}}{M}$ is a function of y.

Applications of a first order Differential equations: Newton's law of cooling; Rate of decay of Radio-active materials.

[Sections: 11.1; 11.3; 11.4; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2; 11.12.4; 12.6; 12.8]

UNIT-3	(12 Hours)

Linear Differential Equations: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working procedure to solve the equation; Method of Variation of Parameters; Applications of Linear Differential Equations: Oscillatory Electrical Circuits.

[Sections: 13.1; 13.2.1; 13.3; 13.4; 13.5; 13.6; 13.7;13.8.1;14.1;14.5].

UNIT-4	(12 Hours)

Laplace Transforms: Definition; conditions for the existence; Transforms of elementary functions; properties of Laplace Transforms; Transforms of derivatives; Transforms of integrals; Multiplication by t^n; Division by t; Inverse transforms- Method of partial fractions; Other methods of finding inverse transforms; Convolution theorem(without proof); Application to differential equations: Solution of ODE with constant coefficients using Laplace transforms.

[Sections:21.2.1; 21.2.2; 21.3; 21.4; 21.7; 21.8; 21.9; 21.10; 21.12; 21.13; 21.14; 21.15.1]

Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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NUMERICAL METHODS AND ADVANCED CALCULUS
I B. Tech. II Semester 20CS201/MA02

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve algebraic, transcendental and system of linear equations with the help of numerical methods.
➢	Apply the techniques of numerical integration whenever and wherever routine methods are not applicable and solve the first order ordinary differential equations numerically with the given initial condition using different methods.
➢	Evaluate double and triple integrals and apply them to find areas and volumes.
➢	Evaluate the line, surface and volume integrals and learn their inter-relations and applications.

Course Outcomes: After studying this course, the students will be able to

CO-1	Solve non-linear equations and system of linear equations with the help of Numerical techniques.
CO-2	Solve the first order ordinary differential equations numerically with the given initial condition.
CO-3	Find the area and volume of plane and three dimensional figures using multiple integrals.
CO-4	Apply vector integral theorems to obtain the solutions of engineering problems involving circulation, flux, and divergence in vector fields.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-
CO-4	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-

UNIT-1 (12 Hours)

Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi's iterative method, Gauss-Seidel iterative method.
[Sections:28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2].

UNIT-2

	(12 Hours)
Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton's interpolation formulae: Newton's forward interpolation formula, Newton's backward interpolation formula; Interpolation with unequal intervals; Lagrange's interpolation formula; Divided differences; Newton's divided difference formula; Numerical integration; Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Numerical solution of ODE's: Introduction; Picard's method; Euler's method; Runge-Kutta method. [Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.2; 32.4; 32.7].	
UNIT-3	(12 Hours)
Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integral, Change of variables. [Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2].	
UNIT-4	(12 Hours)
Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green's theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem(without proof). [Sections: 8.4; 8.5; 8.5.1; 8.5.3; 8.6; 8.11.1; 8.12.2; 8.12.3; 8.13; 8.14; 8.16]	
Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

PROBABILITY AND STATISTICS
II B. Tech. III Semester 20CS301/MA03

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Apply the continuous probability densities to various problems in science and engineering.
➢	Estimate the point and interval estimators of the mean, variance and proportion for the given Sample data and apply Z-test, t-test to various real-life problems
➢	Apply various sample tests like F-test and $\chi 2$ -test for decision making regarding the population based on sample data.
➢	Compute the level of correlation, the best fit curve to the given data by the method of least squares and also perform ANOVA arising in the field of engineering.

Course Outcomes: After studying this course, the students will be able to

CO-1	Apply discrete and continuous probability distributions to various problems arising in Engineering applications.
CO-2	Perform Test of Hypothesis for a population parameter for single sample.
CO-3	Perform Test of Hypothesis for population parameters for multiple samples.
CO-4	Interpret the results of correlation, regression and one way ANOVA for the given data.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	-	-	-	-	-	-	-	-	-	2	-	3	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-
CO-4	3	3	3	-	-	-	-	-	-	-	-	2	-	3	-

UNIT-1 (12 Hours)

Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Gamma Distribution and its applications, Beta Distribution and its applications, Weibull distribution, Joint Distributions (Discrete), Joint Distributions (Continuous).
(Sections 5.1, 5.2, 5.3, 5.5,5.7, 5.8, 5.9, 5.10)

UNIT-2

	(12 Hours)
Populations and Samples, The sampling distribution of the mean (σ known), The sampling distribution of the mean (σ unknown), The sampling distribution of the variance, Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of hypotheses, Hypothesis concerning one mean. (Sections 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.4, 7.5, 7.6)	
UNIT-3	(12 Hours)
Comparisons-Two independent Large samples, Comparisons-Two independent small samples, matched pairs comparisons, The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances. (Sections 8.2, 8.3, 8.4, 9.1, 9.2, 9.3) .	
UNIT-4	(12 Hours)
Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions. The method of least squares, curvilinear regression, multiple regression, correlation, Completely Randomized Designs. (10.1, 10.2, 10.3, 11.1, 11.3, 11.4, 11.6, 12.1, 12.2)	
Text Books :	Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson, 8th Edition, PHI.
References :	1. R.E Walpole, R.H. Myers & S.L. Myers 'Probability & Statistics for Engineers and Scientists', 6th Edition, PHI. 2. Murray R Spiegel, John J.Schiller, R. AluSrinivasa, 'Probability &Satistics', Schaum's outline series.

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

COMPLEX VARIABLES AND SPECIAL FUNCTIONS

II B. Tech. IV Semester 20EC401/20EI401/MA04

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Perceive the importance of acquiring sufficient knowledge on underlying principles of complex analysis and their prominent roles in various applications of numerous concepts.
➢	Determine Taylor and Laurent series expansions of the given functions and utilize residue concept to evaluate many difficult real integrals.
➢	Apply the ideas of Fourier Integrals, Fourier Transforms and their Inverses for addressing the real world problems in an effective manner.
➢	Analyze the properties of Special Functions for the empirical principles of effect hierarchy in recurrence relations and obtain the relevant Series Solutions for differential equations in different cases to overcome the challenging circumstances.

Course Outcomes: After studying this course, the students will be able to

CO-1	Make use of fundamentals of Complex Analysis like n roots of Complex number, Analytic Function, Continuity, Harmonic Conjugates and their important role of applicability in various concepts.
CO-2	Evaluate certain complicated real integrals under Contour integration using residue calculus and also derive the series expansions of given functions by Taylor series and Laurent Series.
CO-3	Utilize various properties and applications of Fourier transforms, their inverses including Convolution Theorem in handling scientific and technical applications.
CO-4	Identify the meaningful Series Solutions for Differential Equations and analyze the Properties of Special Functions in solving specific engineering problems.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	2	-	-	-	-	-	-	-	-	3	-	2	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	3	-	2	-
CO-4	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-

UNIT-1 (12 Hours)

Complex Numbers and functions: Complex Numbers; Geometric Representation of Imaginary numbers; Roots of a complex number; Complex function; Real and imaginary parts of circular and hyperbolic functions; **Calculus of complex functions:** Introduction; Limit of a complex

function; Derivative of f(z); Analytic functions; Harmonic functions; Complex integration; Cauchy's theorem; Cauchy's integral formula. [Sections: 19.1; 19.2; 19.5; 19.7; 19.12; 20.1; 20.2; 20.3; 20.4; 20.5;20.12; 20.13; 20.14]	
UNIT-2	(12 Hours)
Calculus of complex functions : Series of complex terms; Taylor series; Laurent's series; Zeros of an analytic function; Singularities of an analytic function; Residues; Residue theorem; Calculation of residues; Evaluation of real definite integrals: Evaluation around the unit circle, Evaluation around a small semi-circle. [Sections: 20.16.1; 20.16.2; 20.16.3; 20.17.1; 20.17.2; 20.18.1; 20.18.2; 20.19; 20.20]	
UNIT-3	(12 Hours)
Fourier transforms: Introduction; Definition; Fourier integral theorem (without proof); Fourier sine and cosine integrals; Complex form of Fourier integrals; Fourier integral representation of a function; Fourier transforms ; Properties of Fourier transforms; Convolution theorem(without proof); Fourier transforms of the derivative of a function. [Sections: 22.1; 22.2; 22.3.1; 22.3.3; 22.3.4; 22.4; 22.5; 22.6.2; 22.9] .	
UNIT-4	(12 Hours)
Series Solution of Differential Equations and Special Functions: Introduction; Validity of series solution; Series solution when x = 0 is ordinary point of the equation; Frobenius method; Bessel's function; recurrence formula for $J_n(x)$; expansions for J_0 and J_1; value of $J_{1/2}$; generating function for $J_n(x)$; Orthogonality of Bessel functions. [Sections: 16.1;16.2;16.3;16.4;16.5,16.6;16.7;16.8;16.9;16.11]	
Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	[1].Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2].P.Bali and M.Goyal,"A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

LINEAR ALGEBRA AND ORDINATRY DIFFERENTIAL EQUATIONS
I B. Tech. I Semester 20EC101/MA01

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors
➢	Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order ordinary differential equations.
➢	Create and analyze mathematical models using higher order differential equations to solve application problems that arise in engineering.
➢	Solve a linear differential equation with constant coefficients with the given initial conditions using Laplace Transforms.

Course Outcomes: After studying this course, the students will be able to

CO-1	Find the eigen values and eigen vectors of a given matrix and its inverse.
CO-2	Apply the appropriate analytical technique to find the solution of a first order ordinary differential equation.
CO-3	Solve higher order linear differential equations with constant coefficients arise in engineering applications.
CO-4	Apply Laplace transforms to solve differential equations arising in engineering

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-
CO-2	3	3	3	-	-	-	-	-	-	-	-	2	-	2	-
CO-3	3	3	3	-	-	-	-	-	-	-	-	2	-	2	-
CO-4	3	3	3	-	-	-	-	-	-	-	-	2	-	2	-

UNIT-1 (12 Hours)

Linear Algebra: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse; Consistency of linear System of equations: Rouches theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values(without proofs); Cayley-Hamilton theorem (without proof).

[Sections: 2.7.1; 2.7.2; 2.7.6; 2.10.1; 2.10.2; 2.10.3; 2.12.1; 2.13.1; 2.14; 2.15.]

UNIT-2	(12 Hours)

Differential Equations of first order: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree; variables separable; Linear Equations; Bernoulli's equation; Exact Differential equations; Equations reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the equation M dx+ N dy = 0, $\frac{\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}}{N}$ is a function of x and $\frac{\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}}{M}$ is a function of y.

Applications of a first order Differential equations: Newton's law of cooling; Rate of decay of Radio-active materials.

[Sections: 11.1; 11.3; 11.4; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2; 11.12.4; 12.6; 12.8]

UNIT-3	(12 Hours)

Linear Differential Equations: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working procedure to solve the equation; Method of Variation of Parameters; Applications of Linear Differential Equations: Oscillatory Electrical Circuits.

[Sections: 13.1; 13.2.1; 13.3; 13.4; 13.5; 13.6; 13.7;13.8.1;14.1;14.5].

UNIT-4	(12 Hours)

Laplace Transforms: Definition; conditions for the existence; Transforms of elementary functions; properties of Laplace Transforms; Transforms of derivatives; Transforms of integrals; Multiplication by t^n; Division by t; Inverse transforms- Method of partial fractions; Other methods of finding inverse transforms; Convolution theorem(without proof); Application to differential equations: Solution of ODE with constant coefficients using Laplace transforms.

[Sections:21.2.1; 21.2.2; 21.3; 21.4; 21.7; 21.8; 21.9; 21.10; 21.12; 21.13; 21.14; 21.15.1]

Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

NUMERICAL METHODS AND ADVANCED CALCULUS
I B. Tech. II Semester 20EC201/MA02

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve algebraic, transcendental and system of linear equations with the help of numerical methods.
➢	Apply the techniques of numerical integration whenever and wherever routine methods are not applicable and solve the first order ordinary differential equations numerically with the given initial condition using different methods.
➢	Evaluate double and triple integrals and apply them to find areas and volumes.
➢	Evaluate the line, surface and volume integrals and learn their inter-relations and applications.

Course Outcomes: After studying this course, the students will be able to

CO-1	Solve non-linear equations and system of linear equations with the help of Numerical techniques.
CO-2	Solve the first order ordinary differential equations numerically with the given initial condition.
CO-3	Find the area and volume of plane and three dimensional figures using multiple integrals.
CO-4	Apply vector integral theorems to obtain the solutions of engineering problems involving circulation, flux, and divergence in vector fields.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-
CO-4	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-

UNIT-1 (12 Hours)

Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi's iterative method, Gauss-Seidel iterative method.
[Sections:28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2].

UNIT-2

	(12 Hours)
Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton's interpolation formulae: Newton's forward interpolation formula, Newton's backward interpolation formula; Interpolation with unequal intervals; Lagrange's interpolation formula; Divided differences; Newton's divided difference formula; Numerical integration; Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Numerical solution of ODE's: Introduction; Picard's method; Euler's method; Runge-Kutta method. [Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.2; 32.4; 32.7].	
UNIT-3	(12 Hours)
Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integral, Change of variables. [Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2].	
UNIT-4	(12 Hours)
Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green's theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem(without proof). [Sections: 8.4; 8.5; 8.5.1; 8.5.3; 8.6; 8.11.1; 8.12.2; 8.12.3; 8.13; 8.14; 8.16]	
Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

PROBABILITY AND STATISTICS
II B. Tech. III Semester 20EC301/MA03

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Apply the continuous probability densities to various problems in science and engineering.
➢	Estimate the point and interval estimators of the mean, variance and proportion for the given Sample data and apply Z-test, t-test to various real-life problems
➢	Apply various sample tests like F-test and $\chi 2$ -test for decision making regarding the population based on sample data.
➢	Compute the level of correlation, the best fit curve to the given data by the method of least squares and also perform ANOVA arising in the field of engineering.

Course Outcomes: After studying this course, the students will be able to

CO-1	Apply discrete and continuous probability distributions to various problems arising in Engineering applications.
CO-2	Perform Test of Hypothesis for a population parameter for single sample.
CO-3	Perform Test of Hypothesis for population parameters for multiple samples.
CO-4	Interpret the results of correlation, regression and one way ANOVA for the given data.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	-	-	-	-	-	-	-	-	-	2	-	2	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-
CO-4	3	3	3	-	-	-	-	-	-	-	-	2	-	2	-

UNIT-1 (12 Hours)

Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Gamma Distribution and its applications, Beta Distribution and its applications, Weibull distribution, Joint Distributions (Discrete), Joint Distributions (Continuous).
(Sections 5.1, 5.2, 5.3, 5.5,5.7, 5.8, 5.9, 5.10)

UNIT-2	(12 Hours)
Populations and Samples, The sampling distribution of the mean (σ known), The sampling distribution of the mean (σ unknown), The sampling distribution of the variance, Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of hypotheses, Hypothesis concerning one mean. (Sections 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.4, 7.5, 7.6)	
UNIT-3	(12 Hours)
Comparisons-Two independent Large samples, Comparisons-Two independent small samples, matched pairs comparisons, The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances. (Sections 8.2, 8.3, 8.4, 9.1, 9.2, 9.3) .	
UNIT-4	(12 Hours)
Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions. The method of least squares, curvilinear regression, multiple regression, correlation, Completely Randomized Designs. (10.1, 10.2, 10.3, 11.1, 11.3, 11.4, 11.6, 12.1, 12.2)	
Text Books :	Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson, 8th Edition, PHI.
References :	1. R.E Walpole, R.H. Myers & S.L. Myers 'Probability & Statistics for Engineers and Scientists', 6th Edition, PHI. 2. Murray R Spiegel, John J.Schiller, R. AluSrinivasa, 'Probability &Satistics', Schaum's outline series.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

LINEAR ALGEBRA AND ORDINATRY DIFFERENTIAL EQUATIONS
I B. Tech. I Semester 20EE101/MA01

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors
➢	Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order ordinary differential equations.
➢	Create and analyze mathematical models using higher order differential equations to solve application problems that arise in engineering.
➢	Solve a linear differential equation with constant coefficients with the given initial conditions using Laplace Transforms.

Course Outcomes: After studying this course, the students will be able to

CO-1	Find the eigen values and eigen vectors of a given matrix and its inverse.
CO-2	Apply the appropriate analytical technique to find the solution of a first order ordinary differential equation.
CO-3	Solve higher order linear differential equations with constant coefficients arise in engineering applications.
CO-4	Apply Laplace transforms to solve differential equations arising in engineering

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO-2	3	3	3	-	-	-	-	-	-	-	-	2	3	-	-
CO-3	3	3	3	-	-	-	-	-	-	-	-	2	3	-	-
CO-4	3	3	3	-	-	-	-	-	-	-	-	2	3	-	-

UNIT-1 (12 Hours)

Linear Algebra: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse; Consistency of linear System of equations: Rouches theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values(without proofs); Cayley-Hamilton theorem (without proof).
[Sections: 2.7.1; 2.7.2; 2.7.6; 2.10.1; 2.10.2; 2.10.3; 2.12.1; 2.13.1; 2.14; 2.15.]

UNIT-2	(12 Hours)

Differential Equations of first order: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree; variables separable; Linear Equations; Bernoulli's equation; Exact Differential equations; Equations reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the equation M dx+ N dy = 0, $\frac{\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}}{N}$ is a function of x and $\frac{\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}}{M}$ is a function of y.

Applications of a first order Differential equations: Newton's law of cooling; Rate of decay of Radio-active materials.

[Sections: 11.1; 11.3; 11.4; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2; 11.12.4; 12.6; 12.8]

UNIT-3	(12 Hours)

Linear Differential Equations: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working procedure to solve the equation; Method of Variation of Parameters; Applications of Linear Differential Equations: Oscillatory Electrical Circuits.

[Sections: 13.1; 13.2.1; 13.3; 13.4; 13.5; 13.6; 13.7;13.8.1;14.1;14.5].

UNIT-4	(12 Hours)

Laplace Transforms: Definition; conditions for the existence; Transforms of elementary functions; properties of Laplace Transforms; Transforms of derivatives; Transforms of integrals; Multiplication by t^n; Division by t; Inverse transforms- Method of partial fractions; Other methods of finding inverse transforms; Convolution theorem(without proof); Application to differential equations: Solution of ODE with constant coefficients using Laplace transforms.

[Sections:21.2.1; 21.2.2; 21.3; 21.4; 21.7; 21.8; 21.9; 21.10; 21.12; 21.13; 21.14; 21.15.1]

Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

NUMERICAL METHODS AND ADVANCED CALCULUS
I B. Tech. II Semester 20EE201/MA02

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve algebraic, transcendental and system of linear equations with the help of numerical methods.
➢	Apply the techniques of numerical integration whenever and wherever routine methods are not applicable and solve the first order ordinary differential equations numerically with the given initial condition using different methods.
➢	Evaluate double and triple integrals and apply them to find areas and volumes.
➢	Evaluate the line, surface and volume integrals and learn their inter-relations and applications.

Course Outcomes: After studying this course, the students will be able to

CO-1	Solve non-linear equations and system of linear equations with the help of Numerical techniques.
CO-2	Solve the first order ordinary differential equations numerically with the given initial condition.
CO-3	Find the area and volume of plane and three dimensional figures using multiple integrals.
CO-4	Apply vector integral theorems to obtain the solutions of engineering problems involving circulation, flux, and divergence in vector fields.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO-4	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-

UNIT-1 (12 Hours)

Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi's iterative method, Gauss-Seidel iterative method.
[Sections:28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2].

UNIT-2	(12 Hours)
Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton's interpolation formulae: Newton's forward interpolation formula, Newton's backward interpolation formula; Interpolation with unequal intervals; Lagrange's interpolation formula; Divided differences; Newton's divided difference formula; Numerical integration; Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Numerical solution of ODE's: Introduction; Picard's method; Euler's method; Runge-Kutta method. [Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.2; 32.4; 32.7].	
UNIT-3	(12 Hours)
Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integral, Change of variables. [Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2].	
UNIT-4	(12 Hours)
Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green's theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem(without proof). [Sections: 8.4; 8.5; 8.5.1; 8.5.3; 8.6; 8.11.1; 8.12.2; 8.12.3; 8.13; 8.14; 8.16]	
Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

PROBABILITY AND STATISTICS
II B. Tech. III Semester 20EE301/MA03

Lectures	:	2 Hours/Week	Tutorial	:	1 Hours/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Apply the continuous probability densities to various problems in science and engineering.
➢	Estimate the point and interval estimators of the mean, variance and proportion for the given Sample data and apply Z-test, t-test to various real-life problems
➢	Apply various sample tests like F-test and $\chi 2$ -test for decision making regarding the population based on sample data.
➢	Compute the level of correlation, the best fit curve to the given data by the method of least squares and also perform ANOVA arising in the field of engineering.

Course Outcomes: After studying this course, the students will be able to

CO-1	Apply discrete and continuous probability distributions to various problems arising in Engineering applications.
CO-2	Perform Test of Hypothesis for a population parameter for single sample.
CO-3	Perform Test of Hypothesis for population parameters for multiple samples.
CO-4	Interpret the results of correlation, regression and one way ANOVA for the given data.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	-	-	-	-	-	-	-	-	-	2	3	-	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-
CO-4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-

UNIT-1 (12 Hours)

Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Gamma Distribution and its applications, Beta Distribution and its applications, Weibull distribution, Joint Distributions (Discrete), Joint Distributions (Continuous).
(Sections 5.1, 5.2, 5.3, 5.5,5.7, 5.8, 5.9, 5.10)

UNIT-2	(12 Hours)
Populations and Samples, The sampling distribution of the mean (σ known), The sampling distribution of the mean (σ unknown), The sampling distribution of the variance, Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of hypotheses, Hypothesis concerning one mean. (Sections 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.4, 7.5, 7.6)	
UNIT-3	(12 Hours)
Comparisons-Two independent Large samples, Comparisons-Two independent small samples, matched pairs comparisons, The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances. (Sections 8.2, 8.3, 8.4, 9.1, 9.2, 9.3) .	
UNIT-4	(12 Hours)
Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions. The method of least squares, curvilinear regression, multiple regression, correlation, Completely Randomized Designs. (10.1, 10.2, 10.3, 11.1, 11.3, 11.4, 11.6, 12.1, 12.2)	
Text Books :	Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson, 8th Edition, PHI.
References :	1. R.E Walpole, R.H. Myers & S.L. Myers 'Probability & Statistics for Engineers and Scientists', 6th Edition, PHI. 2. Murray R Spiegel, John J.Schiller, R. AluSrinivasa, 'Probability & Satistics', Schaum's outline series.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

LINEAR ALGEBRA AND ORDINATRY DIFFERENTIAL EQUATIONS
I B. Tech. I Semester 20ME101/MA01

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors
➢	Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order ordinary differential equations.
➢	Create and analyze mathematical models using higher order differential equations to solve application problems that arise in engineering.
➢	Solve a linear differential equation with constant coefficients with the given initial conditions using Laplace Transforms.

Course Outcomes: After studying this course, the students will be able to

CO-1	Find the eigen values and eigen vectors of a given matrix and its inverse.
CO-2	Apply the appropriate analytical technique to find the solution of a first order ordinary differential equation.
CO-3	Solve higher order linear differential equations with constant coefficients arise in engineering applications.
CO-4	Apply Laplace transforms to solve differential equations arising in engineering

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-
CO-2	3	3	3	-	-	-	-	-	-	-	-	2	3	-	-
CO-3	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-
CO-4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-

UNIT-1 (12 Hours)

Linear Algebra: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse; Consistency of linear System of equations: Rouches theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values(without proofs); Cayley-Hamilton theorem (without proof).

[Sections: 2.7.1; 2.7.2; 2.7.6; 2.10.1; 2.10.2; 2.10.3; 2.12.1; 2.13.1; 2.14; 2.15.]

UNIT-2

	(12 Hours)

Differential Equations of first order: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree; variables separable; Linear Equations; Bernoulli's equation; Exact Differential equations; Equations reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the equation M dx+ N dy = 0, $\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}$ is a function of x and $\frac{\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}}{M}$ is a function of y.

Applications of a first order Differential equations: Newton's law of cooling; Rate of decay of Radio-active materials.

[Sections: 11.1; 11.3; 11.4; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2; 11.12.4; 12.6; 12.8]

UNIT-3	(12 Hours)

Linear Differential Equations: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working procedure to solve the equation; Method of Variation of Parameters; Applications of Linear Differential Equations: Oscillatory Electrical Circuits.

[Sections: 13.1; 13.2.1; 13.3; 13.4; 13.5; 13.6; 13.7;13.8.1;14.1;14.5].

UNIT-4	(12 Hours)

Laplace Transforms: Definition; conditions for the existence; Transforms of elementary functions; properties of Laplace Transforms; Transforms of derivatives; Transforms of integrals; Multiplication by t^n; Division by t; Inverse transforms- Method of partial fractions; Other methods of finding inverse transforms; Convolution theorem(without proof); Application to differential equations: Solution of ODE with constant coefficients using Laplace transforms.

[Sections:21.2.1; 21.2.2; 21.3; 21.4; 21.7; 21.8; 21.9; 21.10; 21.12; 21.13; 21.14; 21.15.1]

Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

NUMERICAL METHODS AND ADVANCED CALCULUS
I B. Tech. II Semester 20ME201/MA02

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve algebraic, transcendental and system of linear equations with the help of numerical methods.
➢	Apply the techniques of numerical integration whenever and wherever routine methods are not applicable and solve the first order ordinary differential equations numerically with the given initial condition using different methods.
➢	Evaluate double and triple integrals and apply them to find areas and volumes.
➢	Evaluate the line, surface and volume integrals and learn their inter-relations and applications.

Course Outcomes: After studying this course, the students will be able to

CO-1	Solve non-linear equations and system of linear equations with the help of Numerical techniques.
CO-2	Solve the first order ordinary differential equations numerically with the given initial condition.
CO-3	Find the area and volume of plane and three dimensional figures using multiple integrals.
CO-4	Apply vector integral theorems to obtain the solutions of engineering problems involving circulation, flux, and divergence in vector fields.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO-4	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-

UNIT-1 (12 Hours)

Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi's iterative method, Gauss-Seidel iterative method.
[Sections:28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2].

UNIT-2

	(12 Hours)
Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton's interpolation formulae: Newton's forward interpolation formula, Newton's backward interpolation formula; Interpolation with unequal intervals; Lagrange's interpolation formula; Divided differences; Newton's divided difference formula; Numerical integration; Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Numerical solution of ODE's: Introduction; Picard's method; Euler's method; Runge-Kutta method. [Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.2; 32.4; 32.7].	
UNIT-3	(12 Hours)
Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integral, Change of variables. [Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2].	
UNIT-4	(12 Hours)
Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green's theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem(without proof). [Sections: 8.4; 8.5; 8.5.1; 8.5.3; 8.6; 8.11.1; 8.12.2; 8.12.3; 8.13; 8.14; 8.16]	
Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

PROBABILITY AND STATISTICS
II B. Tech. III Semester 20ME301/MA03

Lectures	:	2 Hours/Week	Tutorial	:	1 Hour/Week	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Apply the continuous probability densities to various problems in science and engineering.
➢	Estimate the point and interval estimators of the mean, variance and proportion for the given Sample data and apply Z-test, t-test to various real-life problems
➢	Apply various sample tests like F-test and $\chi 2$ -test for decision making regarding the population based on sample data.
➢	Compute the level of correlation, the best fit curve to the given data by the method of least squares and also perform ANOVA arising in the field of engineering.

Course Outcomes: After studying this course, the students will be able to

CO-1	Apply discrete and continuous probability distributions to various problems arising in Engineering applications.
CO-2	Perform Test of Hypothesis for a population parameter for single sample.
CO-3	Perform Test of Hypothesis for population parameters for multiple samples.
CO-4	Interpret the results of correlation, regression and one way ANOVA for the given data.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO-1	3	3	-	-	-	-	-	-	-	-	-	2	2	-	-
CO-2	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-
CO-3	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-
CO-4	3	3	3	-	-	-	-	-	-	-	-	2	3	-	-

UNIT-1 (12 Hours)

Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Gamma Distribution and its applications, Beta Distribution and its applications, Weibull distribution, Joint Distributions (Discrete), Joint Distributions (Continuous).
(Sections 5.1, 5.2, 5.3, 5.5,5.7, 5.8, 5.9, 5.10)

UNIT-2

	(12 Hours)
Populations and Samples, The sampling distribution of the mean (σ known), The sampling distribution of the mean (σ unknown), The sampling distribution of the variance, Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of hypotheses, Hypothesis concerning one mean. (Sections 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.4, 7.5, 7.6)	
UNIT-3	(12 Hours)
Comparisons-Two independent Large samples, Comparisons-Two independent small samples, matched pairs comparisons, The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances. (Sections 8.2, 8.3, 8.4, 9.1, 9.2, 9.3) .	
UNIT-4	(12 Hours)
Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions. The method of least squares, curvilinear regression, multiple regression, correlation, Completely Randomized Designs. (10.1, 10.2, 10.3, 11.1, 11.3, 11.4, 11.6, 12.1, 12.2)	
Text Books :	Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson, 8th Edition, PHI.
References :	1. R.E Walpole, R.H. Myers & S.L. Myers 'Probability & Statistics for Engineers and Scientists', 6th Edition, PHI. 2. Murray R Spiegel, John J.Schiller, R. AluSrinivasa, 'Probability &Satistics', Schaum's outline series.