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B.E. / B.Tech. – Regulations 2021

For the students admitted 2021 onwards

CHOICE BASED CREDIT SYSTEM

Courses offered by the Department of Mathematics

Semester 1

SI.NO.	COURSE CODE	COURSE TITLE	DEPT.	CATEGORY	L	T	P	J	C
THEORY COURSES									
1	U21MA101	Calculus and differential equations	AD, BM, CE, CH, CS, CS(AIML), EC, IT, ME, MT	BSC	3	1	0	0	4
2	U21MA102	Calculus and linear algebra	EE	BSC	2	1	0	0	3
3	U21MA103	Probability, Statistics and Calculus	CSBS	BSC	3	1	0	0	4

Semester 2

SI.NO.	COURSE CODE	COURSE TITLE	DEPT.	CATEGORY	L	T	P	J	C
THEORY COURSES									
1	U21MA201	Laplace transforms and complex variables	CE, CH, EE, ME, MT	BSC	3	1	0	0	4
2	U21MA202	Transforms and its applications	BM	BSC	3	0	0	0	3
3	U21MA203	Fourier analysis and partial differential equations	CS	BSC	3	1	0	0	4
4	U21MA204	Applied linear algebra	AD, CS(AIML)	BSC	3	0	0	0	3
5	U21MA205	Statistical analysis	AD	BSC	3	0	2	0	4
6	U21MA206	Linear algebra and complex variables	EC	BSC	3	0	2	0	4
7	U21MA207	Numerical methods	CS	BSC	3	1	0	0	4
8	U21MA208	Linear Algebra	CSBS, IT	BSC	3	1	0	0	4

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Semester 3

SI.NO.	COURSE CODE	COURSE TITLE	DEPT.	CATEGORY	L	T	P	J	C
THEORY COURSES									
1	U21MA301	Probability Theory and Distributions	AD	BSC	3	1	0	0	4
2	U21MA302	Linear algebra and complex analysis	BM	BSC	3	1	0	0	4
3	U21MA303	Fourier Analysis and Boundary value problems	CE, EE, ME, MT	BSC	3	1	0	0	4
4	U21MA304	Probability and Random Processes	, EC	BSC	3	0	0	0	3
5	U21MAG01	Probability and Statistics	CS(AIML), CH	BSC	3	1	0	0	4
6	U21MAG02	Discrete Mathematics	CS, IT, CSBS	BSC	3	1	0	0	4

Semester 4

SI.NO.	COURSE CODE	COURSE TITLE	DEPT.	CATEGORY	L	T	P	J	C
THEORY COURSES									
1	U21MA401	Numerical Techniques	CE	BSC	3	0	0	0	3
2	U21MA402	Partial Differential Equations	CH	BSC	2	0	0	0	2
3	U21MA403	Probability and Queueing Theory	CS, IT	BSC	3	0	0	0	3
4	U21MA404	Statistics and Numerical methods	EE, ME, MT	BSC	3	0	0	0	3
5	U21MA405	Statistical Methods	CSBS	BSC	2	0	2	0	3
6	U21MA406	Probability and Stochastic Processes	, BM	BSC	3	0	0	0	3
7	U21MAG02	Discrete Mathematics	AD, CS(AIML)	BSC	3	1	0	0	4

Semester 5

SI.NO.	COURSE CODE	COURSE TITLE	DEPT.	CATEGORY	L	T	P	J	C
THEORY COURSES									
1	U21MA501	Linear Algebra and Number Theory	CS	BSC	3	0	0	0	3
2	U21MA502	Computational Techniques	CH	BSC	3	0	0	0	3

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Open Electives

SI.NO.	COURSE CODE	COURSE TITLE	DEPT.	CATEGORY	L	T	P	J	C
THEORY COURSES									
1	U21MAX01	Mathematical Modelling and Simulation	Common to all	BSC	3	0	0	0	3
2	U21MAX02	Linear Programming Problems	Common to all	BSC	3	0	0	0	3

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SEMESTER I

U21MA101	CALCULUS AND DIFFERENTIAL EQUATIONS (Common to AD, BM, CE, CH, CS, CS(AIML), EC, IT, ME, MI)	Category: BSC				
		L	T	P	J	C
		3	1	0	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of matrices and calculus which will enable them to model and analyze physical phenomena involving continuous change
- To understand the methodologies involved in solving problems related to fundamental principles of calculus
- To develop confidence to model mathematical pattern and give appropriate solutions

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply the knowledge of matrices with the concepts of eigenvalues to study their problems in core areas (Apply)

CO2: Apply the basic techniques and theorems of functions of several variables in other areas of mathematics (Apply)

CO3: Analyze the triple integrals techniques over a region in two dimensional and three dimensional geometry (Apply)

CO4: Apply basic concepts of integration to evaluate line, surface and volume integrals (Apply)

CO5: Solve basic application problems described by second and higher order linear differential equations with constant coefficients (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	2	2	-	-	-	-	-	-	-	-	-	-		
CO4	2	2	-	-	-	-	-	-	-	-	-	-		
CO5	3	2	-	-	-	-	-	-	-	-	-	-		

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

SYLLABUS:

UNIT I MATRICES **9 + 3**

Eigenvalues and eigenvectors – Properties (without proof) – Cayley Hamilton theorem (without proof) – Diagonalization using orthogonal transformation – Applications

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UNIT II FUNCTIONS OF SEVERAL VARIABLES **9 + 3**

Partial derivatives – Total derivative – Jacobians – Taylor's series expansion – Extreme values of functions of two variables – Lagrange multipliers method

UNIT III MULTIPLE INTEGRALS **9 + 3**

Double integrals – Change of order of integration – Triple integrals – Applications in area and volume

UNIT IV LINE AND SURFACE INTEGRALS **9 + 3**

Line integrals – Surface integrals – Green's theorem in a plane – Gauss divergence theorem – Stokes' theorem (excluding proofs)

UNIT V ORDINARY DIFFERENTIAL EQUATIONS **9 + 3**

Second and higher order linear differential equations with constant coefficients – Variable coefficients – Euler Cauchy equation – Legendre's equation – Method of variation of parameters – Applications

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Project – Periods

Total 60 Periods

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley India Pvt Ltd, New Delhi, 2018.
2. Grewal B S, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, New Delhi, 2017.

REFERENCES:

1. Bali N P and Dr Manish Goyal, "A text book of Engineering Mathematics", 12th edition, Laxmi Publications, 2016.
2. Thomas G B and Finney R L, "Calculus and Analytic Geometry", 14th edition, Pearson Education India, 2018.
3. Maurice D Weir, Joel Hass and Christopher Heil, "Thomas Calculus", 14th edition, Pearson Education, India, 2018.
4. James Stewart, "Calculus: Early Transcendental", 7th edition, Cengage Learning, New Delhi, 2015.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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SEMESTER I

U21MA102	CALCULUS AND LINEAR ALGEBRA (for EE)	Category: BSC				
		L	T	P	J	C
		2	1	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of matrices and calculus which will enable them to model and analyze physical phenomena involving continuous change
- To understand the methodologies involved in solving problems related to fundamental principles of calculus
- To understand postulates of vector spaces and linear transformations

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply the knowledge of matrices with the concepts of eigenvalues to study their problems in core areas (Apply)

CO2: Apply the basic techniques and theorems of functions of several variables in other areas of mathematics (Apply)

CO3: Analyze the triple integrals techniques over a region in two dimensional and three dimensional geometry (Apply)

CO4: Use the concepts of base and dimension of vector space and express vector spaces in different dimensions (Understand)

CO5: Analyze the functions defined between vector spaces and express required conditions for a transformation in order to be a linear transformation (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	1		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I MATRICES **6+3**

Eigenvalues and eigenvectors – Properties (without proof) – Cayley Hamilton theorem (without proof) – Diagonalization using orthogonal transformation – Applications

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UNIT II FUNCTIONS OF SEVERAL VARIABLES **6 + 3**

Partial derivatives – Total derivative – Jacobians – Taylor's series expansion – Extreme values of functions of two variables – Lagrange multipliers method

UNIT III MULTIPLE INTEGRALS **6 + 3**

Double integrals – Change of order of integration –Triple integrals – Applications in area and volume

UNIT IV VECTOR SPACES **6 + 3**

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions

UNIT V LINEAR TRANSFORMATION **6 + 3**

General linear transformations – Kernel and range – Matrices of general linear transformation – Geometry linear operators – Change of basis

Contact Periods:

Lecture: 30 Periods Tutorial: 15 Periods Practical: – Periods Project – Periods

Total 45 Periods

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition Wiley India Pvt Ltd, New Delhi, 2018.
2. Howard Anton and Chris Rorres, "Elementary Linear Algebra", 11th edition, John Wiley & Sons Inc, 2013.

REFERENCES:

1. Bali N P and Dr Manish Goyal, "A text book of Engineering Mathematics", 12th edition, Laxmi Publications, 2016.
2. Thomas G B and Finney R L, "Calculus and Analytic Geometry", 9th edition, Pearson Education India, 2018.
3. Maurice D Weir, Joel Hass and Christopher Heil, "Thomas Calculus", 14th edition, Pearson Education, India, 2018.
4. Gilbert Strang, "Linear Algebra and its Applications", 4th edition, Cengage India Pvt. Ltd, 2005.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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SEMESTER I

U21MA103	PROBABILITY, STATISTICS AND CALCULUS (for CSBS)	Category: BSC				
		L	T	P	J	C
		3	1	0	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of probability, random variable and distributions
- To understand the concepts of Statistics in the field of engineering and technology
- To understand the basic concepts of differential and integral calculus

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply probability axioms and the moments of discrete and continuous random variables to solve core engineering problems (Apply)

CO2: Use discrete and continuous probability distributions including requirements, mean and variance for making decisions (Understand)

CO3: Apply the concepts of statistics to numerical data for performing exploratory analysis (Apply)

CO4: Use histograms and box plots to display data graphically and calculate measures of central tendency and variability (Understand)

CO5: Compute maxima and minima of problems using differential calculus and find the area and volume using integral calculus (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	1		
CO3	3	2	-		-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
CO5	3	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:		1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)				

SYLLABUS:

UNIT I PROBABILITY **9 + 3**

Probability – Axioms of probability – Conditional probability – Baye's theorem – Discrete and continuous random variables – Moments – Moment generating functions

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UNIT II PROBABILITY DISTRIBUTIONS **9 + 3**

Discrete and continuous distributions: Binomial distribution – Poisson distribution – Uniform distribution – Exponential distribution – Normal distribution

UNIT III STATISTICS **9 + 3**

Definition of statistics – Basic objectives – Applications in various branches of science with examples – Collection of data: Internal and external data – Primary and secondary data

UNIT IV DISCRIPTIVE STATISTICS **9 + 3**

Classification and tabulation of univariate data – Frequency distribution – Bar graphs and Pie charts – Histogram – Ogive – Measures of central tendency – Measures of variability

UNIT V CALCULUS **9 + 3**

Partial derivatives – Total derivatives – Extreme values of functions of two variables – Double and triple integrals with applications

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Project – Periods

Total 60 Periods

TEXT BOOKS:

1. Milton J S and Arnold J C, "Introduction to Probability and Statistics", 4th edition, Tata McGraw Hill, 2008.
2. Douglas C. Montgomery and George C. Runger, "Applied Statistics and Probability for Engineers", 3rd edition, John Wiley & Sons, 2003.
3. Grewal B S, "Higher Engineering Mathematics", 44th edition, Khanna Publication, Delhi, 2017.

REFERENCES:

1. Ross S M, "A first course in Probability", 9th edition, Prentice Hall, 2012.
2. Miller I R, Freund J E and Johnson R, "Probability and Statistics for Engineers", 9th edition, Pearson, 2017.
3. Mood A M, Graybill F A and Boes D C, "Introduction to the Theory of Statistics", 3rd edition, McGraw Hill Education, 2001.
4. Gun A M, Gupta M K and Dasgupta B, "Fundamentals of Statistics", Vol. I & II, 1st edition, World Press, 2013 & 2017.

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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SEMESTER II

U21MA201	LAPLACE TRANSFORMS AND COMPLEX VARIABLES (Common to CE, EE, CH, ME, MI)	Category: BSC				
		L	T	P	J	C
		3	1	0	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the mathematical aspects of conversion time domain to frequency domain using Laplace transform and Inverse Laplace transform vice versa
- To use the concepts of complex analysis, in the study of heat flow, fluid dynamics and electrostatics
- To understand the concepts of singularities in the various domains of engineering fields

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply the concepts of Laplace transform in core engineering applications (Apply)

CO2: Apply the concepts of Inverse Laplace transform with their properties in engineering field (Apply)

CO3: analyze the complex functions and their mapping in certain complex planes (Understand)

CO4: Evaluate complex contour integrals directly and use the Cauchy integral theorem in its various versions (Understand)

CO5: Compute the residues of a function at given points or singularities and use the residue theorem to evaluate a contour integral (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	2	2	-	-	-	-	-	-	-	-	-	-		
CO4	2	2	-	-	-	-	-	-	-	-	-	-		
CO5	3	3	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I LAPLACE TRANSFORM **9 + 3**

Laplace transform – Conditions for existence – Transform of elementary functions – Standard properties (statement only) – Transforms of unit step function – Impulse function – Periodic function – Initial and final value theorems – Convolution theorem(without proof)

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UNIT II INVERSE LAPLACE TRANSFORM **9 + 3**

Inverse Laplace transform – Standard properties (statement only) – Second order linear differential equations with constant coefficients

UNIT III COMPLEX DIFFERENTIATION **9 + 3**

Analytic functions: Cauchy-Riemann equations (Cartesian form) and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Construction of analytic functions – Bilinear transformations

UNIT IV COMPLEX INTEGRATION **9 + 3**

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula

UNIT V SINGULARITIES AND RESIDUES **9 + 3**

Taylor's and Laurent's series expansions – Singular points – Classification of singularities – Residues – Cauchy's residue theorem

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Project – Periods

Total 60 Periods

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley India Pvt Ltd, New Delhi, 2018.
2. Grewal B S, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, New Delhi, 2017.

REFERENCES:

1. Bali N P and Dr Manish Goyal, "A text book of Engineering Mathematics", 12th edition, Laxmi Publications, 2016.
2. Thomas G B and Finney R L, "Calculus and Analytic Geometry", 14th edition, Pearson Education India, 2018.
3. James Stewart, "Calculus: Early Transcendental", 7th edition, Cengage Learning, New Delhi, 2015.

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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SEMESTER II

U21MA202	TRANSFORMS AND ITS APPLICATIONS (for BM)	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand Fourier analysis for periodic and aperiodic signals
- To understand the concepts of Laplace Transforms to find solutions of initial value problems for linear ordinary differential equations
- To understand the concept of Z-transform techniques in the field of engineering

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Use the periodicity of a function and formulate the same as a combination of sine and cosine using Fourier series (Understand)

CO2: Analyze the spectral characteristics of signals using Fourier transforms (Apply)

CO3: Apply the concepts of Laplace transform with their properties in circuit theory and control systems (Apply)

CO4: Apply the concepts of Inverse Laplace transform with their properties in core engineering applications (Apply)

CO5: Analyze the signal discretized in time and check for their stability, frequency response (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	-		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)		2: Moderate (Medium)						3: Substantial (High)					

SYLLABUS:

UNIT I FOURIER SERIES 9

Dirichlet's conditions – general Fourier series – odd and even functions – half range sine series – Half range cosine series – Parseval's identity – harmonic analysis

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UNIT II FOURIER TRANSFORM 9

Fourier transform pair – Fourier sine and cosine transforms – properties (without proof) – transforms of simple functions – convolution theorem – Parseval's identity

UNIT III LAPLACE TRANSFORM 9

Transform of standard functions – transform of unit step function and unit impulse function — transforms of derivatives and integrals – transform of periodic functions

UNIT IV INVERSE LAPLACE TRANSFORM 9

Inverse Laplace transform – convolution theorem – ordinary differential equations with constant coefficients

UNIT V Z – TRANSFORM 9

Z–transforms – elementary properties – inverse Z–transform – initial and final value theorems (statement only) – convolution theorem – formation of difference equations – difference equations using Z – transform

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total 45 Periods

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley India Pvt Ltd, New Delhi, 2018.
2. Wylie C. R. and Barrett L. C., "Advanced Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2016.
3. Grewal B S, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, New Delhi, 2017.

REFERENCES:

1. Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 2016.
2. Bali N P and Dr Manish Goyal, "A text book of Engineering Mathematics", 12th edition, Laxmi Publications, 2016.
3. Peter V. O'Neil, "Advanced Engineering Mathematics", Cengage, New Delhi, 2016.
4. James, G., "Advanced Modern Engineering Mathematics", Pearson Education, 3rd edition, 2013.

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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SEMESTER II

U21MA203	FOURIER ANALYSIS AND PARTIAL DIFFERENTIAL EQUATIONS (for CS)	Category: BSC				
		L	T	P	J	C
		3	1	0	0	4

PRE–REQUISITES:

- U21MA101 : Calculus and Differential Equations

COURSE OBJECTIVES:

- To understand the concepts of PDE and its solutions
- To understand the concept of Fourier transform techniques in the field of engineering
- To understand the concepts of mathematical aspects that contribute to the solution of One dimensional wave and heat equation

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply a range of techniques to find solutions of standard partial differential equations (Apply)

CO2: Use the periodicity of a function and formulate the same as a combination of sine and cosine using Fourier series (Understand)

CO3: Analyze the spectral characteristics of signals using Fourier transforms (Apply)

CO4: Apply Fourier series to solve an initial–boundary value problem for one dimensional wave and heat equation (Apply)

CO5: Apply Fourier series to solve an initial–boundary value problem for two dimensional heat equation (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-		
CO2	3	2	-	-	-	-	-	-	-	-	-	1		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)		2: Moderate (Medium)							3: Substantial (High)				

SYLLABUS:

UNIT I PARTIAL DIFFERENTIAL EQUATIONS **9 + 3**

Formation of partial differential equations – Singular integrals – Solutions of standard types of first order partial differential equations – Lagrange's linear equation – Solution methods for second order homogeneous equations with constant coefficients

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UNIT II FOURIER SERIES **9 + 3**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range series – Parseval's identity – Harmonic analysis

UNIT III FOURIER TRANSFORM **9 + 3**

Fourier transform pair – Fourier sine and cosine transforms – Properties (Without proof) – Transforms of simple functions – Convolution theorem – Parseval's identity

UNIT IV ONE DIMENSIONAL BOUNDARY VALUE PROBLEMS **9 + 3**

Fourier series solution – Vibration of strings – One dimensional wave equation – One dimensional heat flow equation (unsteady state)

UNIT V TWO DIMENSIONAL BOUNDARY VALUE PROBLEMS **9 + 3**

Fourier series solution – Two dimensional (steady state) heat flow equations(Cartesian form only) – Separation of variables

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Project – Periods

Total 60 Periods

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley India Pvt Ltd, New Delhi, 2018.
2. Grewal B S, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, New Delhi, 2017.

REFERENCES:

1. Bali N P and Dr Manish Goyal, "A text book of Engineering Mathematics", 12th edition, Laxmi Publications, 2016.
2. Wylie C. R. and Barrett L. C, "Advanced Engineering Mathematics", 6th edition, Tata McGraw-Hill, New Delhi, 2016.
3. Narayanan S, Manicavachagom Pillay T. K. and Ramanaiah G, "Advanced Mathematics for Engineering Students", Vol. II & III, 2nd edition, S. Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

SEMESTER II

U21MA204	APPLIED LINEAR ALGEBRA (Common to AD, CS(AIML))	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To acquire knowledge of decomposition of matrices
- To understand postulates of vector spaces and linear transformations
- To understand concepts of eigenvalues and eigenvectors of a matrix and inner product spaces

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply the concepts of the linear system of equations to solve core engineering problems (Apply)

CO2: Analyze the basic properties of vector spaces and subspaces and find basis and dimension of a vector space (Understand)

CO3: Compute linear transformations, kernel and range, and inverse linear transformations and find matrices of general linear transformations (Understand)

CO4: Compute inner products on a real vector space and compute angle and orthogonality in inner product spaces to solve application problems (Understand)

CO5: Find the eigen values and eigen vectors of the linear transformations for the simple real life problems (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	1		
CO5	3	2	-	-	-	-	-	-	-	-	-	1		

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

SYLLABUS:

UNIT I LINEAR SYSTEMS 9

Geometric interpretation of linear system in 2 and 3 unknowns – Row reduction and echelon forms – Vector equation – Matrix equation Ax=b-LU decomposition – Applications of linear systems

DEPARTMENT OF MATHEMATICS KPRIET CBE

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UNIT II VECTOR SPACES 9

Vector spaces and subspaces – Linear combination, Span, linear independence and dependence – Null space, column space, and row space – Basis and dimension of a vector space – Rank and nullity – Applications to electrical network

UNIT III LINEAR TRANSFORMATION 9

General linear transformations – Kernel and range – Matrices of general linear transformation – Geometry linear operators – Change of basis

UNIT IV INNER PRODUCT SPACES 9

Inner product, length, angle and orthogonality – Orthogonal sets – Orthogonal projections – Inner product spaces – Orthonormal basis: Gram-Schmidt process

UNIT V EIGENVALUES AND EIGENVECTORS 9

Eigenvalues and eigenvectors – Singular value decomposition – Eigenvalues and linear transformations – Linear discrete dynamical systems – Direct Method

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total 45 Periods

TEXT BOOKS:

1. Howard Anton and Chris Rorres, "Elementary Linear Algebra", 11th edition, John Wiley & Sons Inc, 2011.
2. David C. Lay, "Linear Algebra and its Applications", 5th edition, Pearson Education, 2015.

REFERENCES:

1. Gilbert Strang, "Linear Algebra and its Applications", 4th edition, Cengage India Pvt. Ltd., , 2005.
2. Steven J. Leon, "Linear Algebra with Applications", 9th edition, Pearson College Division, 2014.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER II

U21MA205	STASTICAL ANALYSIS (for AD)	Category: BSC				
		L	T	P	J	C
		3	0	2	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of statistics in the field of engineering and technology
- To understand the concepts of testing of hypothesis for small and large samples
- To understand design of experiments in the field of engineering and technology

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Analyse statistical information given in descriptive form and interpret the data with the appropriate graphs (Understand)

CO2: Apply various sampling methods to solve core engineering problems (Apply)

CO3: Formulate and test a hypothesis, using critical values to draw conclusions and determining probability of making errors in hypothesis tests (Apply)

CO4: Analyse the correlation and regression techniques and explore variable relationships (Understand)

CO5: Compute and interpret the results of real time applications by performing ANOVA and F test (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	1		
CO5	3	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I DESCRIPTIVE STATISTICS 9

Overview of probability distribution – Frequency distribution – Bar graphs and Pie charts – Histogram – Ogive – Measures of central tenancy – Measures of variability

DEPARTMENT OF MATHEMATICS KPRIET CBE

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UNIT II SAMPLING 9

Sample mean and variance – Sampling distributions – Statistical estimation of parameters, confidence intervals – Applications to statistical quality control and reliability analysis

UNIT III TESTING OF HYPOTHESIS 9

Large sample test for single mean – Small sample test: t, F distributions – Tests for goodness of fit

UNIT IV CORRELATION AND REGRESSION 9

Estimation using the regression line – Correlation analysis – Limitations, errors, and caveats of using regression and correlation analyses

UNIT V DESIGN OF EXPERIMENTS 9

Analysis of variance – Completely randomized design, randomized block design

LIST OF EXPERIMENTS

1. Frequency Distribution
2. Graphical Representation of Data
3. Measures of central Tendency
4. Measures of Dispersion
5. Small Sample test – Single mean – t-test
6. Small Sample test – Difference of Mean – t-test
7. Small Sample test – Difference of Mean with Paired – t-test
8. Correlation, Rank correlation, Regression
9. One way ANOVA
10. Two way ANOVA

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: 30 Periods Project: – Periods

Total: 75 Periods

TEXT BOOKS:

1. Ronald E. Walpole, Raymond H. Meyers and Sharon L. Meyers, "Probability and Statistics for Engineers and Scientists", 9th edition, Pearson Education, 2013.
2. Jay L. Devore, "Probability and Statistics for Engineering and Sciences", 9th edition, Cengage India Pvt. Ltd., 2020.

REFERENCES:

1. Sheldon M.Ross, "Introduction to Probability Models", 12th edition, Elsevier, 2019.
2. Douglas C Montgomery and George C Runger, "Applied Statistics and Probability for Engineers", 6th edition, John Wiley & Sons, 2016.
3. Trivedi K.S., "Probability and Statistics with Reliability, Queuing and Computer Science Applications", 2nd edition, John Wiley & Sons, 2015.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

EVALUATION PATTERN:

Continuous Internal Assessments				End Semester Examinations	
Assessment I (Theory) (100 Marks)		**Assessment II (Practical) (100 Marks)**		**Theory Examinations (Examinations will be conducted for 100 Marks)**	**Practical Examinations (Examinations will be conducted for 100 Marks)**
Individual Assignment / Seminar / MCQ	Written Test	Evaluation of Laboratory Observation, Record **(Rubrics Based Assessments)**	Test		
40	**60**	**75**	**25**		
25		**25**		**35**	**15**
50				**50**	
Total: 100					

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS
KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER II

U21MA206	LINEAR ALGEBRA AND COMPLEX VARIABLES (for EC)	Category: BSC				
		L	T	P	J	C
		3	0	2	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of vector space for solving time domain control theory
- To use the concepts of complex analysis electrostatics
- To understand the concepts of singularities in the various domains of engineering fields

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply the concepts of the linear system of equations to solve core engineering problems (Apply)

CO2: Compare the linear independence and dependence of vectors and basis of vector space (Understand)

CO3: Analyze the complex functions and their mapping in certain complex planes (Understand)

CO4: Evaluate complex contour integrals directly and use the Cauchy integral theorem in its various versions (Understand)

CO5: Compute the residues of a function at given points or singularities and use the residue theorem to evaluate a contour integral (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-		
CO2	3	2	-	-	-	-	-	-	-	-	-	1		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	1		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)				3: Substantial (High)						

SYLLABUS:

UNIT I LINEAR SYSTEMS **9**

Geometric interpretation of linear system in 2 and 3 unknowns – Row reduction and echelon forms – Vector equation – Matrix equation Ax=b-LU decomposition – Applications of linear systems

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

UNIT II VECTOR SPACES 9

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions – General linear transformations – Kernel and range – Matrices of general linear transformation – Geometry linear operators – Change of basis

UNIT III COMPLEX DIFFERENTIATION 9

Functions of a complex variable – Analytic functions: Cauchy – Riemann equations (Cartesian form) and sufficient conditions (excluding proof) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Bilinear transformation

UNIT IV COMPLEX INTEGRATION 9

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula

UNIT V SINGULARITIES AND RESIDUES 9

Taylor's and Laurent's series expansions – Singular points – Classification of singularities – Residues – Cauchy's residue theorem

LIST OF EXPERIMENTS

1. Entering row vector, column vector, accessing blocks of elements in MATLAB
2. Entering matrices to locate matrix elements and entering any entry through indexing in MATLAB
3. Find the sum, product, transpose, inverse, determinant and rank of matrices using MATLAB
4. Solving system of linear equations in MATLAB using Gauss elimination method
5. Solving system of linear equations in MATLAB using Inverse method
6. Solving system of linear equations in MATLAB using linsolve
7. Find the poles and zeros of a transfer function using MATLAB

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: 30 Periods Project: – Periods

Total: 75 Periods

TEXT BOOKS:

1. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2017.
2. Howard Anton and Chris Rorres, "Elementary Linear Algebra", 11th edition, John Wiley & Sons, 2011.

REFERENCES:

1. Bali N.P and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications; 12th edition, 2016.
2. Thomas G.B and R.L Finney, "Calculus and Analytic Geometry", Pearson Education India; 14th edition, 2010.
3. Gilbert Strang, "Linear Algebra and its Applications", Thomson Learning, 2009.
4. Steven J. Leon, "Linear Algebra with Applications", 9th edition, Pearson College Division, 2014.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

EVALUATION PATTERN:

				End Semester Examinations	
Assessment I (Theory) (100 Marks)		**Assessment II (Practical) (100 Marks)**		**Theory Examinations (Examinations will be conducted for 100 Marks)**	**Practical Examinations (Examinations will be conducted for 100 Marks)**
Individual Assignment / Seminar / MCQ	Written Test	Evaluation of Laboratory Observation, Record **(Rubrics Based Assessments)**	Test		
40	**60**	**75**	**25**		
25		**25**		**35**	**15**
50				**50**	
Total: 100					

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS
KPRIET CBE

HOD-MATHS
KPRIET-CBE

SEMESTER II

U21MA207	NUMERICAL METHODS (for CS)	Category: BSC				
		L	T	P	J	C
		3	1	0	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of direct and iterative method for solving algebraic and transcendental equations using numerical methods of interpolation
- To obtain the solution of differentiation and integration using standard numerical techniques in solving kinematics simulation and composite materials
- To understand the concepts of ordinary and partial differential equations in elastic beams and elastic bars using numerical techniques

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Identify the basic concepts of solving algebraic and transcendental equations (Understand)

CO2: Apply interpolation methods for given discrete data set (Understand)

CO3: Apply numerical differentiation and integration methods to find numerical solutions of ordinary and partial differential equations (Understand)

CO4: Solve initial value problems of ordinary differential equations using numerical techniques (Understand)

CO5: Use finite difference techniques, implicit and explicit methods for solving boundary value problem of partial differential equations (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	1		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I SYSTEM OF EQUATIONS **9 + 3**

Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Gauss Jordan method – Gauss Seidel method

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

UNIT II INTERPOLATION **9 + 3**

Interpolation with equal intervals – Newton's forward and backward difference formulae – Interpolation with unequal intervals – Lagrange interpolation

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION **9 + 3**

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule – Evaluation of double integrals by Trapezoidal rule

UNIT IV NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **9 + 3**

Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations

UNIT V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS **9 + 3**

Finite difference method – Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Project – Periods

Total 60 Periods

TEXT BOOKS:

1. Burden R L and Faires J D, "Numerical Analysis", 9th edition, Cengage Learning, 2016.
2. Grewal B S and Grewal J S, "Numerical Methods in Engineering and Science", 10th edition, Khanna Publishers, , New Delhi, 2015.

REFERENCES:

1. Jain M K, Iyengar S R K., Jain R K, "Numerical Methods for Scientific and Engineering computation", 6th edition, New Age international publishers, 2019.
2. Sastry S S, "Introductory Methods of Numerical Analysis", 5th edition, PHI Learning Pvt. Ltd, 2015.
3. Steven C Chapra and Raymond P Canale, "Numerical Methods for Engineers", 7th edition Tata McGraw-Hill, New Delhi, 2017.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER II

U21MA208	LINEAR ALGEBRA (Common to CSBS & IT)	Category: BSC				
		L	T	P	J	C
		3	1	0	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of decomposition of matrices
- To understand the concepts of independence, basis and dimensions in vector spaces
- To understand the concepts of inner product spaces and orthogonality

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Implement the various matrix techniques in solving the system of linear equations (Understand)

CO2: Use the concept of vector spaces to predict an orthonormal basis (Understand)

CO3: Attribute a set of vectors in an inner product space using Gram-Schmidt orthogonalisation and decompose a given matrix using QR decomposition (Understand)

CO4: Find the Eigen values and Eigen vectors of the linear transformations for the simple real life problems (Understand)

CO5: Apply the Singular value decomposition and Principal component analysis technique to real world datasets for performing the dimensional reduction on the given data (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	1	-	-	-	-	1	2		
CO2	3	2	1	1	-	1	-	-	-	-	1	2		
CO3	3	2	1	1	-	1	-	-	-	-	1	2		
CO4	3	2	2	1	-	1	-	-	-	-	1	2		
CO5	3	2	2	1	-	1	-	-	-	-	1	2		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I MATRICES **9 + 3**

Vectors and Linear combinations – Rank of a matrix – Solution of system of linear equations by Gaussian elimination, Gauss Jordan and LU decomposition methods

DEPARTMENT OF MATHEMATICS KPRIET CBE

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Learn Beyond

UNIT II VECTOR SPACE **9 + 3**

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear dependence and independence – Bases and dimensions

UNIT III INNER PRODUCT SPACE **9 + 3**

Introduction to linear transformation – Inner product – Norm – Angle - Orthogonality: definition and simple problems – Projections – Gram Schmidt orthogonalization and QR decomposition

UNIT IV EIGENVALUE PROBLEMS **9 + 3**

Linear transformations – Range, kernel and problems – Eigenvalues and eigenvectors – Hermitian and unitary matrices (simple problems)

UNIT V PRINCIPAL COMPONENT ANALYSIS **9 + 3**

Positive definite matrices – Cayley-Hamilton theorem – Singular value decomposition and principal component analysis using the covariance method – Introduction to their applications in image processing and machine learning (problems not included)

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Project – Periods

Total 60 Periods

TEXT BOOKS:

1. Howard Anton and Chris Rorres, "Elementary Linear Algebra – Applications version", 9th edition, John Wiley & Sons, 2005.
2. David C. Lay, "Linear Algebra and its Applications", 5th edition, Pearson College Division, 2014.

REFERENCES:

1. Steven J. Leon, "Linear Algebra with Applications", 9th edition, Pearson College Division, 2014.
2. Gilbert Strang, "Introduction to Linear Algebra", 5th edition, Wellesley Publishers, 2016.
3. Gonzalez R C and Woods R E, "Digital Image Processing", 4th edition, Pearson Education, 2018.

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER III

U21MA301	PROBABILITY THEORY AND DISTRIBUTIONS (for AD)	Category: BSC				
		L	T	P	J	C
		3	1	0	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the mathematical concepts of probability, one and two dimensional random variables and distributions
- To understand the concepts of various distributions
- To understand the concepts of random processes which are widely used in IT fields

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply probability axioms and the moments of discrete and continuous random variables to core engineering problems (Apply)

CO2: Use discrete probability distributions including requirements, mean and variance for making decisions (Understand)

CO3: Use continuous probability distributions including requirements, mean and variance for making decisions (Understand)

CO4: Compare correlation and linear regression with respect to two dimensional random variables (Understand)

CO5: Analyze the simple classes of discrete random processes to model random arrivals (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)		2: Moderate (Medium)					3: Substantial (High)						

SYLLABUS:

UNIT I PROBABILITY AND RANDOM VARIABLES **9 + 3**

Axioms of probability – Conditional probability – Total probability – Bayes' theorem – Random variable – Distribution function – Properties – Probability mass function – Probability density function – Moments – Moment generating functions

DEPARTMENT OF MATHEMATICS KPRIET CBE

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Learn Beyond

UNIT II DISCRETE DISTRIBUTIONS **9 + 3**

Bernoulli distribution – Binomial distribution – Poisson distribution – Geometric distribution – Moments – moment generating functions and properties for the above distributions

UNIT III CONTINUOUS DISTRIBUTIONS **9 + 3**

Exponential distribution – Uniform distribution – Gamma distribution – Normal distribution – Moments – Moment generating functions and properties for the above distributions

UNIT IV TWO DIMENSIONAL RANDOM VARIABLES **9 + 3**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and regression – Central limit theorem (without proof)

UNIT V RANDOM PROCESSES **9 + 3**

Definition and examples – Stationary process – Wide sense stationary – Markov chain – Bernoulli and Poisson processes

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Project – Periods

Total 60 Periods

TEXT BOOKS:

1. Oliver C. Ibe, "Fundamentals of Applied probability and Random processes", 2nd edition, Elsevier, 2014.
2. Johnson R A, Miller I and Freund J, "Miller and Freund's Probability and Statistics for Engineers", 8th edition, Pearson Education, Asia, 2015.

REFERENCES:

1. Allen A. O, "Probability, Statistics and Queueing Theory with computer applications", 2nd edition, Elsevier, 2005.
2. Trivedi K. S, "Probability and Statistics with Reliability, Queueing and computer science Applications", 2nd edition, John Wiley and sons, 2012.
3. Gupta S C and Kapoor V K, "Fundamentals of Mathematical Statistics", 10th edition, Sultan Chand Publishers, 2014.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER III

U21MA302	LINEAR ALGEBRA AND COMPLEX ANALYSIS (for BM)	Category: BSC				
		L	T	P	J	C
		3	1	0	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of vector space for solving time domain control theory
- To use the concepts of complex analysis in electrostatics
- To understand the concepts of singularities in the various domains of engineering fields

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply the concepts of linear systems to solve the real life problems (Apply)

CO2: Analyze the concepts of basis and dimensions of vector spaces and express vector spaces in different dimensions (Understand)

CO3: Attribute the various properties of analytic functions and construct the analytic functions using various methods (Understand)

CO4: Evaluate complex contour integrals directly by applying the Cauchy integral theorem in various forms (Understand)

CO5: Evaluate complex integrals using the residue theorem and represent functions as Taylor, power and Laurent series (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-		
CO2	3	2	-	-	-	-	-	-	-	-	-	1		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)		2: Moderate (Medium)						3: Substantial (High)					

SYLLABUS:

UNIT I LINEAR SYSTEMS **9 + 3**

Geometric interpretation of linear system in 2 and 3 unknowns – Row reduction and echelon forms – vector equation – Matrix equation Ax=b-LU decomposition – Applications of linear systems

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

UNIT II VECTOR SPACES **9 + 3**

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions - General linear transformations – Kernel and range – Matrices of general linear transformation – Change of basis

UNIT III COMPLEX DIFFERENTIATION **9 + 3**

Functions of a complex variable – Analytic functions: Cauchy-Riemann equations (Cartesian form) and sufficient conditions (excluding proof) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Bilinear transformation

UNIT IV COMPLEX INTEGRATION **9 + 3**

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula

UNIT V SINGULARITIES AND RESIDUES **9 + 3**

Taylor's and Laurent's series expansions – Singular points – Classification of singularities – Residues – Cauchy's residue theorem – Applications to real integral

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Project – Periods

Total 60 Periods

TEXT BOOKS:

1. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2017.
2. Howard Anton and Chris Rorres, "Elementary Linear Algebra", 11th edition John Wiley & Sons, 2011.

REFERENCES:

1. Bali N.P and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications; 12th edition, 2016.
2. Thomas G.B and R.L Finney, "Calculus and Analytic Geometry", Pearson Education India, 14th edition, 2010.
3. Gilbert Strang, "Linear Algebra and its Applications", 4th edition, Cengage India Pvt. Ltd., 2005.
4. Steven J. Leon, "Linear Algebra with Applications", 9th edition, Pearson College Division, 20014.

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER III

U21MA303	FOURIER ANALYSIS AND BOUNDARY VALUE PROBLEMS (Common to CE, EE, ME, MI)	Category: BSC				
		L	T	P	J	C
		3	1	0	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of partial differential equations and its solutions
- To understand the concept of Fourier series and Fourier transform techniques in the field of engineering
- To understand the mathematical aspects that contribute to the solution of one and two dimensional PDEs

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply the fundamental concepts of partial differential equations to solve real life practical applications (Apply)

CO2: Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications and digital signal processing (Apply)

CO3: Analyze the spectral characteristics of signals using Fourier transforms to find the discrete/continuous function arising in signals (Apply)

CO4: Apply Fourier series to solve an initial–boundary value problem for one dimensional wave and heat equation (Apply)

CO5: Apply Fourier series to solve an initial–boundary value for two dimensional heat equations (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-		
CO2	3	2	-	-	-	-	-	-	-	-	-	1		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)		2: Moderate (Medium)				3: Substantial (High)							

SYLLABUS:

UNIT I PARTIAL DIFFERENTIAL EQUATIONS **9 + 3**

Formation of partial differential equations – Singular integrals – Solutions of standard types of first order partial differential equations – Lagrange's linear equation – Solution methods for second order homogeneous equations with constant coefficients

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

UNIT II FOURIER SERIES **9 + 3**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range series – Parseval's identity – Harmonic analysis

UNIT III FOURIER TRANSFORM **9 + 3**

Fourier transform pair – Fourier sine and cosine transforms – Properties (without proof) – Transforms of simple functions – Convolution theorem – Parseval's identity

UNIT IV ONE DIMENSIONAL BOUNDARY VALUE PROBLEMS **9 + 3**

Fourier series solution – Vibration of strings – One dimensional wave equation – One dimensional heat flow equation (unsteady state)

UNIT V TWO DIMENSIONAL BOUNDARY VALUE PROBLEMS **9 + 3**

Fourier series solution – Two dimensional (steady state) heat flow equations(Cartesian form only) separation of variables

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Project – Periods

Total 60 Periods

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition Wiley India Pvt Ltd, New Delhi, 2018.
2. Grewal B. S, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2017.

REFERENCES:

1. Bali N.P and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications; 12th edition, 2016.
2. Wylie C. R. and Barrett L. C, "Advanced Engineering Mathematics", 6th edition, Tata McGraw-Hill, New Delhi, 2016.
3. Narayanan S, Manicavachagom Pillay T. K. and Ramanaiah G, "Advanced Mathematics for Engineering Students", Vol. II & III, 2nd edition, S. Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

HOD-MATHS
KPRIET-CBE.

DEPARTMENT OF MATHEMATICS
KPRIET CBE

KPRIET
Learn Beyond

SEMESTER III

U21MA304	PROBABILITY AND RANDOM PROCESSES (for EC)	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the mathematical concepts of probability, one and two-dimensional random variables and distributions
- To understand the concepts of random processes with real life examples
- To understand the concept of spectral density in communication systems, networks, signal processing systems, and control systems

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply probability axioms and the moments of discrete and continuous random variables to core engineering problems (Apply)

CO2: Use discrete probability distributions including requirements, mean and variance for making decisions (Understand)

CO3: Compare correlation and linear regression with respect to two dimensional random variables (Understand)

CO4: Analyze the simple classes of discrete random processes to model random arrivals (Understand)

CO5: Compare correlation functions and spectral density functions based on the properties (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)		2: Moderate (Medium)					3: Substantial (High)						

SYLLABUS:

UNIT I PROBABILITY AND RANDOM VARIABLES 9

Probability – Axioms of probability – Conditional probability – Total probability – Baye's theorem – Discrete and continuous random variables – Moments – Moment generating functions

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

UNIT II DISTRIBUTION FUNCTIONS **9**

Binomial distribution – Poisson distribution – Exponential distribution – Uniform distribution – Normal distribution – Applications

UNIT III TWO DIMENSIONAL RANDOM VARIABLES **9**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression

UNIT IV RANDOM PROCESSES **9**

Classification – Stationary process – Markov chain – Bernoulli and Poisson process

UNIT V CORRELATION AND SPECTRAL DENSITIES **9**

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total: 45 Periods

TEXT BOOKS:

1. Oliver C.Ibe, "Fundamentals of Applied Probability and Random Processes", Elsevier Academic Press, 2nd edition, 2014.
2. Peebles P.Z., "Probability, Random Variables and Random Signal Principles", 4th edition, Tata McGraw Hill, New Delhi, 2002.
3. Dimitri P. Bertsekas and John N. Tsitsiklis., "Introduction to Probability", 2nd edition, Athena Scientific, 2008.

REFERENCES:

1. Cooper G.R. and McGillem C.D, "Probabilistic Methods of Signal and System Analysis", Oxford University Press, New Delhi, 3rd Indian edition, 2012.
2. Stark. H., and Woods J.W., "Probability and Random Processes with Applications to Signal Processing", 3rd edition, Pearson Education, Asia, 2002.
3. Miller S L and Childers D G, "Probability and Random Processes with Applications to Signal Processing and Communications", 2nd edition, Elsevier, 2012.

EVALUATION PATTERN:

Continuous Internal Assessments					End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER IV

U21MA401	NUMERICAL TECHNIQUES (for CE)	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of direct and iterative method for solving algebraic and transcendental equations using numerical methods of interpolation
- To obtain the solution of differentiation and integration using standard numerical techniques in solving kinematics simulation and composite materials
- To understand the concepts of ordinary and partial differential equations in elastic beams and elastic bars using numerical techniques

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply the concepts of algebraic and transcendental equations to solve core engineering problems (Understand)

CO2: Use the concepts of interpolation for mathematical problems arising in various field (Understand)

CO3: Utilize differentiation and integration methods for finite difference and finite element method (Understand)

CO4: Solve initial value problems of ordinary differential equations using numerical techniques (Understand)

CO5: Use finite difference techniques, implicit and explicit methods for solving boundary value problem of partial differential equations (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	2	2	-	-	-	-	-	-	-	-	-	-		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		

Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

SYLLABUS:

UNIT I SYSTEM OF EQUATIONS 9

Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Gauss Jordan method – Gauss Seidel method

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

UNIT II INTERPOLATION 9

Interpolation with equal intervals – Newton's forward and backward difference formulae – Interpolation with unequal intervals – Lagrange interpolation

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal rule – Simpson's 1/3 rule – Evaluation of double integrals by Trapezoidal rule

UNIT IV NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9

Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations

UNIT V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 9

Finite difference method – Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total: 45 Periods

TEXT BOOKS:

1. Burden R L and Faires J D, "Numerical Analysis", 9th edition, Cengage Learning, 2016
2. Grewal B S and Grewal J S, "Numerical Methods in Engineering and Science", 10th edition, Khanna Publishers, New Delhi, 2015

REFERENCES:

1. Jain M K, Iyengar S R K. and Jain R K, "Numerical Methods for Scientific and Engineering computation", 6th edition, New Age international publishers, 2019
2. Sastry S S, "Introductory Methods of Numerical Analysis", 5th edition, PHI Learning Pvt. Ltd, 2012
3. Steven C Chapra and Raymond P Canale, "Numerical Methods for Engineers", 7th edition Tata McGraw-Hill, New Delhi, 2016

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

SEMESTER IV

U21MA402	PARTIAL DIFFERENTIAL EQUATIONS (for CH)	Category: BSC				
		L	T	P	J	C
		2	0	0	0	2

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of partial differential equations in diffusion and concentration of chemicals
- To understand the concepts of Fourier series to obtain solution of one dimensional wave and heat equation
- To understand the concepts Fourier series to obtain solution of two dimensional heat equations

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Analyse the formation of differential equation from the given problems and to solve first order ordinary differential equation by various methods (Apply)

CO2: Apply a range of techniques to find solutions of standard partial differential equations (Apply)

CO3: Demonstrate accurate and efficient use of Fourier series analysis techniques and their applications in the theory of PDE's (Apply)

CO4: Apply Fourier series to solve an initial–boundary value problem for one dimensional wave equation (Apply)

CO5: Apply Fourier series to solve an initial–boundary value for two dimensional heat equations (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	2	2	-	-	-	-	-	-	-	-	-	-		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SYLLABUS:

UNIT I FORMATION OF PARTIAL DIFFERENTIAL EQUATIONS 6

Formation of partial differential equations – Singular integrals – Solutions of standard types of first order partial differential equations

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

UNIT II SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 6

Lagrange's linear equation – Solution methods for second order homogeneous equations with constant coefficients

UNIT III FOURIER SERIES 6

General Fourier series – Full range series *(0,2l)* – Half range Sine and Cosine series *(0,l)*

UNIT IV ONE DIMENSIONAL BOUNDARY VALUE PROBLEMS 6

Fourier series solution – Vibration of strings – One dimensional wave equation – One dimensional heat flow equation (unsteady state)

UNIT V TWO DIMENSIONAL BOUNDARY VALUE PROBLEMS 6

Fourier series solution – Two dimensional (steady state) heat flow equation (Cartesian form only) – Separation of variables

Contact Periods:

Lecture: 30 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total: 30 Periods

TEXT BOOKS:

1. Grewal B S, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, New Delhi, 2017
2. Erwin Kreyzig, "Advanced Engineering Mathematics", 10th edition, John Wiley & Sons, New Delhi, 2018

REFERENCES:

1. Bali N P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th edition, Laxmi Publications Pvt Ltd, 2014
2. Peter V O Neil, "Advanced Engineering Mathematics", 7th edition, Cengage, New Delhi, 2016

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

SEMESTER IV

U21MA403	PROBABILITY AND QUEUEING THEORY (Common to CS & IT)	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the mathematical concepts of probability, one and two dimensional random variables and distributions
- To understand the concepts of random processes which are widely used in IT fields
- To use the concept of queueing models in the field of engineering

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply probability theory and random variable as a need for the analysis of random experiment (Apply)

CO2: Use discrete and continuous probability distributions including requirements, mean and variance for making decisions (Understand)

CO3: Distinguish correlation and linear regression in two dimensional random variables (Understand)

CO4: Apply various Processes in low pass and band pass noise models (Apply)

CO5: Compute the traffic intensity, blocked traffic and the utilization of some queuing systems (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	2	2	-	-	-	-	-	-	-	-	-	-		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)		2: Moderate (Medium)						3: Substantial (High)					

SYLLABUS:

UNIT I PROBABILITY 9

Probability – Axioms of probability – Conditional probability – Total probability – Baye's theorem – Discrete and continuous random variables – Moments – Moment generating functions

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
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UNIT II DISTRIBUTION FUNCTIONS **9**

Binomial distribution – Poisson distribution – Exponential distribution – Uniform distribution – Normal distribution – Applications

UNIT III TWO – DIMENSIONAL RANDOM VARIABLES **9**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression

UNIT IV RANDOM PROCESSES **9**

Classification – Stationary process – Markov chain – Bernoulli and Poisson Process

UNIT V QUEUEING MODELS **9**

Markovian queues – Birth and death processes – Single and multiple server queueing models – Little's formulas with finite waiting rooms

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total 45 Periods

TEXT BOOKS:

1. Oliver C. Ibe, "Fundamentals of Applied probability and Random processes", 2nd edition, Elsevier, 2014
2. Gross D and Harris C M, "Fundamentals of Queueing Theory", Wiley Students 4th edition, 2012

REFERENCES:

1. Allen A. O. "Probability, Statistics and Queueing Theory with computer applications", 2nd edition, Elsevier, 2005
2. Taha H. A, "Operations Research", 9th edition, Pearson Education, Asia, 2014
3. Trivedi K. S, "Probability and Statistics with Reliability, Queueing and computer science applications", 2nd edition, John Wiley & sons, 2012
4. Narayanan S, Manicavachagom Pillay T. K and Ramanaiah G, "Advanced Mathematics for Engineering Students", Vol. II & III, 2nd edition, S. Viswanathan Publishers Pvt. Ltd, Chennai, 1998

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER IV

U21MA404	STATISTICS AND NUMERICAL METHODS (Common to EE, ME & MI)	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of probability and statistics in the field of engineering
- To understand the concepts of testing the hypothesis for large and small samples
- To understand the concepts in design of experiments in the field of engineering

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply probability axioms and the moments of discrete and continuous random variables to core engineering problems (Apply)

CO2: Analyze large and small sample tests and perform small sample tests based on Chi-square, t and F distributions (Understand)

CO3: Design an experiment with proper observations and measurement to get a valid result using various design methods (Understand)

CO4: Identify the basic concepts of solving algebraic and transcendental equations (Understand)

CO5: Solve initial value problems of ordinary differential equations using numerical techniques (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	2	2	-	-	-	-	-	-	-	-	-	-		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)		2: Moderate (Medium)						3: Substantial (High)					

SYLLABUS:

UNIT I PROBABILITY 9

Probability – Axioms of probability – Conditional probability – Total probability – Baye's Theorem – Discrete and continuous random variable

UNIT II TESTING OF HYPOTHESIS 9

Large sample test for single mean and difference of means – Small sample test: t distribution – Chi square distribution – F distribution

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

UNIT III DESIGN OF EXPERIMENTS 9

One way and two way classifications – Completely randomized design – Randomized block Design – Latin square design

UNIT IV SYSTEM OF EQUATIONS 9

Newton Raphson method – Gauss elimination method – Gauss Jordon method – Iterative methods of Gauss Jacobi and Gauss Seidel

UNIT V NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS 9

Taylor's series method – Euler method – Modified Euler method – Fourth order Runge kutta method for solving first order differential equations

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total: 45 Periods

TEXT BOOKS:

1. Johnson R A, Miller I, Freund J, Miller and Freund's, "Probability and Statistics for Engineers", 8th edition, Pearson Education, Asia,2015
2. Grewell B S, "Numerical methods in Science and Engineering", 9th edition, Khanna Publishers, 2015
3. Gupta S C and Kapoor V K, "Fundamentals of Mathematical Statistics", 10th edition, Sultan Chand Publishers, 2014

REFERENCES:

1. Bali N P and Manish Goyal "A textbook of Engineering Mathematics", 12th edition, Laxmi Publishers, 2016

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

KPRIET-CBE

KPRIET
Learn Beyond

SEMESTER IV

U21MA405	STATISTICAL METHODS (for CSBS)	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

PRE–REQUISITES:

- U21MA103: Probability, Statistics and Calculus

COURSE OBJECTIVES:

- To understand statistical techniques and methods of estimation
- To gain the knowledge on test of hypothesis and how they relate to engineering applications
- To know the fundamental concepts of non parametric inference

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply the concept of sampling distribution and estimation theory in forecasting (Apply)

CO2: Analyze large and small sample tests and perform small sample tests based on Chi-square, t distributions and F distributions (Apply)

CO3: Use the appropriate non parametric hypothesis testing procedures based on inferences (Understand)

CO4: Design an experiment with proper observations and measurement to get a valid result using various design methods (Understand)

CO5: Develop the model for the given time series and estimate the required forecasting (Understand)

CO-PO MAPPING:

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	2	-	-	-	-	-	-	1		
CO2	3	2	-	-	2	-	-	-	-	-	-	-		
CO3	3	2	-	-	2	-	-	-	-	-	-	-		
CO4	3	3	-	-	2	-	-	-	-	-	-	-		
CO5	2	2	-	-	2	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)					3: Substantial (High)					

SYLLABUS:

UNIT I SAMPLING TECHNIQUES AND ESTIMATION THEORY 6

Random sampling – Sampling from finite and infinite populations – Estimates and standard error (sampling with replacement and sampling without replacement) – Sampling distribution of sample mean – Stratified random sampling – Estimation: Point estimation – Criteria for good estimates (unbiasedness, consistency) – Methods of estimation including maximum likelihood estimation – Sufficient statistic: concept and examples – Complete sufficiency their application in estimation – Central limit theorem (excluding proof)

HOD-MATHS
KPRIET-CBE.

DEPARTMENT OF MATHEMATICS KPRIET CBE

KPRIET
Learn Beyond

UNIT II TESTING OF HYPOTHESIS 6

Concept and formulation – Type I and type II errors – Procedures of testing: large samples: tests for single mean – Difference of means and single proportion – Small samples – Student's t test: tests for single mean and difference of means – F test: test for equality of variances – Chi-Square test: tests for goodness of fit and Independence of attributes

UNIT III NON PARAMETRIC INFERENCE 6

Comparison with parametric inference – Use of order statistics – Sign test – Wilcoxon signed rank test – Mann Whitney test – Run test – Kolmogorov-Smirnov test – Spearman's and Kendall's test – Tolerance region (simple problems only)

UNIT IV DESIGN OF EXPERIMENTS AND LINEAR STATISTICAL MODELS 6

Analysis of variance: completely randomized design – Randomized block design – Simple linear regression and correlation – Least squares method – Rank correlation

UNIT V BASICS OF TIME SERIES ANALYSIS AND FORECASTING 6

Stationary – ARIMA models: least square method and maximum likelihood identification – Estimation – Forecasting

LIST OF EXPERIMENTS

1. Frequency Distribution
2. Graphical Representation of Data
3. Measures of central Tendency
4. Measures of Dispersion
5. Small Sample test – Single mean – t-test
6. Small Sample test – Difference of Mean – t-test
7. Small Sample test – Difference of Mean with Paired – t-test
8. Correlation, Rank correlation, Regression
9. One way ANOVA
10. Two way ANOVA

Contact Periods:

Lecture: 30 Periods Tutorial: – Periods Practical: 30 Periods Project: – Periods

Total: 60 Periods

TEXT BOOKS:

1. Douglas C. Montgomery, George C. Runger, "Applied Statistics and Probability for Engineers", 3rd edition, John Wiley & Sons, 2003
2. Chris Chatfield, "The Analysis of Time Series: An Introduction", 6th edition, Chapman and Hall/CRC, 2003
3. Garrett Grolemund, "Hands-on Programming with R", 1st edition, O'Reilly, 2014

REFERENCES:

1. Montgomery D C, Peck E A and Vining G G, "Introduction to Linear Regression Analysis", 5th edition, John Wiley & Sons, 2012
2. Mood A M, Graybill F A and Boes D C, "Introduction to the Theory of Statistics", 3rd edition, McGraw Hill, 2001
3. Draper N and Smith H, "Applied Regression Analysis", 3rd edition, John Wiley & Sons, 1998
4. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", 2nd edition, Addison Wesley Professional, 2017

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

EVALUATION PATTERN:

Continuous Internal Assessments				End Semester Examinations	
Assessment I (Theory) (100 Marks)		Assessment II (Practical) (100 Marks)		Theory Examinations (Examinations will be conducted for 100 Marks)	Practical Examinations (Examinations will be conducted for 100 Marks)
Individual Assignment / Seminar / MCQ	Written Test	Evaluation of Laboratory Observation, Record (Rubrics Based Assessments)	Test		
40	60	75	25		
25		25		25	25
50				50	
Total: 100					

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS
KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER IV

U21MA406	PROBABILITY AND STOHASTIC PROCESSES (for BM)	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of probability, random variable and distributions that are applicable in the field of engineering
- To understand the concepts of stochastic processes with real life examples
- To understand the concepts of testing of hypothesis for small and large samples which plays an important role in testing of fertilizers and chemical products

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply probability axioms and the moments of discrete and continuous random variables to core engineering problems (Apply)

CO2: Use discrete probability distributions including requirements, mean and variance for making decisions (Understand)

CO3: Compare correlation and linear regression with respect to two dimensional random variables (Understand)

CO4: Analyze the simple classes of discrete random processes to model random arrivals (Apply)

CO5: Analyze large and small sample tests and perform small sample tests based on Chi-square t and F distributions (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
CO5	3	3	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I PROBABILITY 9

Probability – Axioms of probability – Conditional probability – Baye's theorem – Discrete and continuous random variables – Moments – Moment generating functions

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

UNIT II DISTRIBUTION FUNCTIONS 9

Binomial distribution – Poisson distribution – Geometric distribution – Uniform distribution – Exponential distribution – Normal distribution

UNIT III TWO DIMENSIONAL RANDOM VARIABLES 9

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression

UNIT IV STOCHASTIC PROCESSES 9

Classification – Stationary process – Markov chain – Bernoulli and Poisson process

UNIT V TESTING OF HYPOTHESIS 9

Large sample test for single mean and difference of means – Small sample test: t distribution – F distribution – Chi square distribution

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total: 45 Periods

TEXT BOOKS:

1. Milton J S and Arnold J C, "Introduction to Probability and Statistics", 4th edition, Tata McGraw Hill, 2008
2. Oliver C.Ibe, "Fundamentals of Applied Probability and Random Processes", Elsevier Academic Press, 2nd edition, 2014

REFERENCES:

1. Johnson R A, "Miller and Freund's Probability and Statistics for Engineers", 8th edition, Pearson Education, Asia, 2015
2. Devore J L, "Probability and Statistics for Engineering and the Sciences", 8th edition, Cengage Learning, New Delhi, 2014
3. Ross S M, "Introduction to Probability and Statistics for Engineers and Scientists", 3rd edition, Elsevier, 2010
4. Stark H., and Woods J.W., "Probability and Random Processes with Applications to Signal Processing", 3rd edition, Pearson Education, Asia, 2002

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER V

U21MA501	LINEAR ALGEBRA AND NUMBER THEORY (for CS)	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of vector spaces, linear combination and inner product spaces
- To acquire knowledge in the basic concepts of number theory
- To understand the concepts of multiplicative functions

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply the fundamental concepts of advanced algebra and their role in modern mathematics (Apply)

CO2: Solve the problems on linear transformation and to construct the inner product space to find the orthogonal and orthonormal basis using orthogonalization method (Understand)

CO3: Determine the accurate and efficient use of advanced algebraic techniques (Understand)

CO4: Use the Chinese remainder theorem to solve a system two or more simultaneous linear congruences (Understand)

CO5: Apply integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject (Understand)

CO-PO MAPPING:

COs \ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	2	-	-	-	-	-	-	1		
CO2	3	2	-	-	2	-	-	-	-	-	-	1		
CO3	3	2	-	-	2	-	-	-	-	-	-	1		
CO4	3	2	-	-	2	-	-	-	-	-	-	1		
CO5	3	2	-	-	2	-	-	-	-	-	-	1		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I VECTOR SPACES 9

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear dependence and independence – Bases and dimensions

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

UNIT II LINEAR TRANSFORMATION AND INNER PRODUCT SPACES 9

Linear transformation – Null spaces and ranges – Dimension theorem – Matrix representation of a linear transformation – Inner product – Norms – Gram Schimdt orthogonalization process

UNIT III DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS 9

Division algorithm – Base – b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM

UNIT IV DIOPHANTINE EQUATIONS AND CONGRUENCES 9

Linear Diophantine equations – Congruence's – Linear congruence's – Applications: divisibility tests – Modular exponentiation – Chinese remainder theorem – 2 x 2 linear systems

UNIT V CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS 9

Wilson's theorem – Fermat's little theorem – Euler's theorem – Euler's Phi functions – Tau and sigma functions

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total: 45 Periods

TEXT BOOKS:

1. Friedberg A. H, Insel A. J. and Spence L, "Linear Algebra", 4th edition, Prentice Hall of India, New Delhi, 2004.
2. Koshy T, "Elementary Number Theory with Applications", Elsevier Publications, 2nd edition, New Delhi, 2002.

REFERENCES:

1. Kolman B and Hill D. R, "Introductory Linear Algebra", 1st edition, Pearson Education, New Delhi, 2009.
2. Kumaresan S, "Linear Algebra – A Geometric Approach", Prentice – Hall of India, New Delhi, Reprint, 1st edition, 2010.
3. Lay D.C, "Linear Algebra and its Applications", 5th edition, Pearson Education, 2015.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER IV

U21MA502	COMPUTATIONAL TECHNIQUES (for CH)	Category: BSC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of direct and iterative method for solving algebraic and transcendental equations using numerical methods of interpolation
- To obtain the solution of differentiation and integration using standard numerical techniques in solving kinematics simulation and composite materials
- To understand the concepts of ordinary and partial differential equations in elastic beams and elastic bars using numerical techniques

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply the concepts of algebraic and transcendental equations to solve core engineering problems (Understand)

CO2: Use the concepts of interpolation for mathematical problems arising in various field (Understand)

CO3: Utilize differentiation and integration methods for finite difference and finite element method (Understand)

CO4: Solve initial value problems of ordinary differential equations using numerical techniques (Understand)

CO5: Use finite difference techniques, implicit and explicit methods for solving boundary value problem of partial differential equations (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	2	2	-	-	-	-	-	-	-	-	-	-		
CO5	2	2	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I SYSTEM OF EQUATIONS **6**

Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Gauss Jordan method – Gauss Seidel method

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

UNIT II INTERPOLATION 6

Interpolation with equal intervals – Newton's forward and backward difference formulae – Interpolation with unequal intervals – Lagrange interpolation

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 6

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal rule – Simpson's 1/3 rule – Evaluation of double integrals by Trapezoidal rule

UNIT IV NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 6

Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations

UNIT V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 6

Finite difference method – Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method

Contact Periods:

Lecture: 30 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total: 30 Periods

TEXT BOOKS:

1. Burden R L and Faires J D, "Numerical Analysis", 9th edition, Cengage Learning, 2016
2. Grewal B S and Grewal J S, "Numerical Methods in Engineering and Science", 10th edition, Khanna Publishers, New Delhi, 2015

REFERENCES:

1. Jain M K, Iyengar S R K. and Jain R K, "Numerical Methods for Scientific and Engineering computation", 6th edition, New Age international publishers, 2019
2. Sastry S S, "Introductory Methods of Numerical Analysis", 5th edition, PHI Learning Pvt. Ltd, 2012
3. Steven C Chapra and Raymond P Canale, "Numerical Methods for Engineers", 7th edition Tata McGraw-Hill, New Delhi, 2016

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER III

U21MAG01	PROBABILITY AND STATISTICS (CH, CS(AIML))	Category: BSC				
		L	T	P	J	C
		3	1	0	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the concepts of probability, random variable and distributions that are applicable in the field of engineering
- To understand the concepts of testing of hypothesis for small and large samples which plays an important role in testing of industrial products
- To understand the concepts in design of experiments in the field of engineering

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply probability axioms and the moments of discrete and continuous random variables to core engineering problems (Apply)

CO2: Use discrete probability distributions including requirements, mean and variance for making decisions (Understand)

CO3: Compare correlation and linear regression with respect to two dimensional random variables (Understand)

CO4: Analyze large and small sample tests and perform small sample tests based on Chi-square, t and F distributions (Apply)

CO5: Design an experiment with proper observations and measurement to get a valid result using various design methods (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
CO5	3	3	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I PROBABILITY **9 + 3**

Probability – Axioms of probability – Conditional probability – Baye's theorem – Discrete and continuous random variables – Moments – Moment generating functions

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

UNIT II DISTRIBUTION FUNCTIONS **9 + 3**

Binomial distribution – Poisson distribution – Geometric distribution – Uniform distribution – Exponential distribution – Normal distribution

UNIT III TWO – DIMENSIONAL RANDOM VARIABLES **9 + 3**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression

UNIT IV TESTING OF HYPOTHESIS **9 + 3**

Large sample test for single mean and difference of means – Small sample test: t distribution – F distribution – Chi square distribution

UNIT V DESIGN OF EXPERIMENTS **9 + 3**

One way and two way classifications – Completely randomized design – Randomized block design – Latin square design

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Project – Periods

Total 60 Periods

TEXT BOOKS:

1. Milton J S and Arnold J C, "Introduction to Probability and Statistics", 4th edition, Tata McGraw Hill, 2008
2. Gupta S C and Kapoor V K, "Fundamentals of Mathematical Statistics", 11th edition, Sultan Chand & Sons, New Delhi, 2013

REFERENCES:

1. Johnson R A, "Miller and Freund's Probability and Statistics for Engineers", 8th edition, Pearson Education, Asia, 2015
2. Devore J L, "Probability and Statistics for Engineering and the Sciences", 8th edition, Cengage Learning, New Delhi, 2014
3. Ross S M, "Introduction to Probability and Statistics for Engineers and Scientists", 3rd edition, Elsevier, 2010
4. Walpole R E, Myers R H, Myers S L and Ye K, "Probability and Statistics for Engineers and Scientists", 10th edition, Pearson Education, Asia, 2012

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

SEMESTER III & IV

U21MAG02	DISCRETE MATHEMATICS (Common to AD, CS, CS(AIML), CSBS, IT)	Category: BSC				
		L	T	P	J	C
		3	1	0	0	4

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the basic concepts of propositions by various discrete structure techniques
- To understand the concepts in combinatorics techniques in solving the system by various methodology
- To understand the concepts of the different differential and integral techniques in solving the real time engineering problems

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Use the concepts of Boolean algebra for the analysis & design of various combinational & sequential logic circuits (Understand)

CO2: Use the mathematical concepts in abstract algebra with respect to characteristics of sets, group, ring and field (Understand)

CO3: Apply combinatorial principles and techniques to solve counting problems and linear recurrence relation (Understand)

CO4: Apply graph theory concepts to test and validate intuition and independent mathematical thinking in problem solving (Apply)

CO5: Analyze natural language arguments by means of symbolic propositional logic and proofs (Understand)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	1		
CO2	3	2	-	-	-	-	-	-	-	-	-	-		
CO3	3	2	-	-	-	-	-	-	-	-	-	-		
CO4	3	2	-	-	-	-	-	-	-	-	-	-		
CO5	3	3	-	-	-	-	-	-	-	-	-	-		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I BOOLEAN ALGEBRA **9 + 3**

Boolean algebra – truth table – basic logic gate – Basic postulates of Boolean algebra – Principle of duality – Canonical form – Karnaugh map

DEPARTMENT OF MATHEMATICS KPRIET CBE

HOD-MATHS
KPRIET-CBE.

UNIT II ABSTRACT ALGEBRA **9 + 3**

Algebra of sets – The power set – Ordered pairs and Cartesian product – Relations on sets – Types of relations and their properties – Equivalence relations – Functions – Type of functions – Group – Semi group – monoid – abelian group – sub group – ring – field

UNIT III COMBINATORICS **9 + 3**

Basics of counting – Pigeonhole principle – Permutations and combinations – Recurrence relations – Generating functions – Mathematical Induction

UNIT IV GRAPH THEORY **9 + 3**

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton graphs – Shortest path – Graph coloring

UNIT V LOGIC **9 + 3**

Propositional logic – Propositional equivalences – Inconsistency predicates – Quantifiers – Rules of inference – Introduction to proofs – Method of proofs

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: – Periods Project – Periods

Total 60 Periods

TEXT BOOKS:

1. Herstein N, "Topics in Algebra", 2nd edition, John Wiley and Sons, 2006
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, Tata McGraw Hill Pub. Co. Ltd, New Delhi, Special Indian Edition, 2016
3. Tremblay J. P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", 7th edition, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 2011

REFERENCES:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th edition, Pearson Education Asia, Delhi, 2014
2. Thomas Koshy, "Discrete Mathematics with Applications", 1st edition, Elsevier Publications, 2008
3. Seymour Lipschutz and Mark Lipson, "Discrete Mathematics", 3rd edition, Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 2010

EVALUATION PATTERN:

Continuous Internal Assessments				Total Internal Assessments	End Semester Examinations
Assessment I (100 Marks)		Assessment II (100 Marks)			
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

HOD-MATHS
KPRIET-CBE.

KPRIET
Learn Beyond

Open Elective

SEMESTER V

U21MAX01	MATHEMATICAL MODELING AND SIMULATION (Common to all)	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the basic concepts of mathematical modeling
- To understand the applications using modeling and simulation
- To identify different optimization techniques

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Apply the basics of mathematical tools using Sage Math (Apply)

CO2: Apply the structure of coding and error analysis (Apply)

CO3: Interpret modeling of techniques (Understand)

CO4: Implement optimization techniques to resolve problems (Understand)

CO5: Use the mathematical modeling to solve the engineering problems (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	2	-	-	-	-	-	-	1		
CO2	3	2	1	-	1	-	-	-	-	-	-	1		
CO3	3	2	1	-	1	-	-	-	-	-	-	1		
CO4	3	2	1	-	1	-	-	-	-	-	-	1		
CO5	3	2	1	-	1	-	-	-	1	-	-	1		
Correlation levels:	1: Slight (Low)			2: Moderate (Medium)						3: Substantial (High)				

SYLLABUS:

UNIT I MATHEMATICAL PROGRAMMING **9**

Math reckoner – Structuring data – Polynomial systems – Analysis – Graphics and computational domains using Sage Math

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UNIT II FUNCTIONS AND CODING BLOCKS 9

Basic syntax in Matlab – Common functions – Basic graphics – Structure of coding – Program execution – Error analysis

UNIT III SYSTEM MODELING AND SIMULATION 9

Fundamentals of modeling using Matlab – Classification of models – Modeling techniques – Mathematical modeling of physical systems – Simulations: constructing, running and saving data in Matlab – Interpretation of results

UNIT IV OPTIMIZATION TECHNIQUES 9

Functions of linear and non-linear optimization – Optimization using numerical methods: solving equations – Optimization techniques using toolbox – Optimization using symbolic computation

UNIT V APPLICATIONS 9

Modeling in electric circuits – Car safety bumper – Water flow in a river – Heat conduction in a square plate using Matlab

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total: 45 Periods

TEXT BOOKS:

1. Paul Zimmermann, "Computational Mathematics with Sage Math", 1st edition, SIAM Publications, 2019.
2. Devendra K Chaturvedi, "Modeling and simulation of systems using MATLAB and Simulink", CRC press, 1st edition, 2017.

REFERENCES:

1. Niket S Kaisare, "Computational Techniques for Process Simulation and Analysis Using MATLAB", CRC Press, 1st edition, 2017.
2. Cesar Lopez, "MATLAB optimization techniques", A press, 1st edition, 2014.
3. William J Paul, "MATLAB for engineering applications", Mc Graw Hill, 4th edition, 2018.
4. Steven I Gordon and Brian Guilfoos, "Introduction to Modeling and Simulation with MATLAB and Python", CRC Press, 1st edition, 2017.
5. Andrew Knight, "Basics of MATLAB and beyond", CRC press, 1st edition, 2019.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		Assessment II (100 Marks)		Total Internal Assessments	End Semester Examinations
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	60	40	60	200	100
Total				40	60
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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KPRIET
Learn Beyond

Open Elective

Semester VI

U21MAX02	LINEAR PROGRAMMING PROBLEMS (Common to all)	Category: OEC				
		L	T	P	J	C
		3	0	0	0	3

PRE–REQUISITES:

- Nil

COURSE OBJECTIVES:

- To understand the basic concepts of resource management techniques
- To solve problems in linear programming and Integer programming
- To familiar with CPM and PERT

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Solve optimization problems using simplex method (Understand)

CO2: Solve transportation and assignment problems (Understand)

CO3: Apply integer programming and linear programming to solve real-life applications (Apply)

CO4: Use mathematical software to solve the proposed models (Understand)

CO5: Use PERT and CPM for problems in project management (Apply)

CO-PO MAPPING:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	1	-	-	-	-	-	-	1		
CO2	2	2	1	-	1	-	-	-	-	-	-	1		
CO3	2	1	1	-	1	-	-	-	-	-	-	1		
CO4	3	2	1	-	1	-	-	-	-	-	-	1		
CO5	3	3	1	-	1	-	-	-	-	-	-	1		
Correlation levels: 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)														

SYLLABUS:

UNIT I LINEAR PROGRAMMING **9**

Principal components of decision problem – Modeling phases – LP formulation and graphic solution – Resource allocation problems – Simplex method – Sensitivity analysis

UNIT II DUALITY AND NETWORKS **9**

Definition of dual problem – Primal – Dual relationships – Dual simplex methods – Post optimality analysis – Transportation and assignment model - Shortest route problem

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UNIT III INTEGER PROGRAMMING 9

Cutting plan algorithm – Branch and bound methods, multistage (dynamic) programming

UNIT IV CLASSICAL OPTIMIZATION THEORY 9

Unconstrained external problems, Newton Ralphson method – Equality constraints – Jacobean methods – Lagrangian method – Kuhn – Tucker conditions – Simple problems

UNIT V OBJECT SCHEDULING 9

Network diagram representation – Critical path method – Time charts and resource levelling – PERT

Contact Periods:

Lecture: 45 Periods Tutorial: – Periods Practical: – Periods Project – Periods

Total: 45 Periods

TEXT BOOKS:

1. Taha H A, "Operation Research", 10th edition, Pearson Education, 2019.
2. Grewal B A, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2017.

REFERENCES:

1. Paneer Selvam, "Operations Research", 2nd edition, Pearson Education, 2016.
2. Anderson, "Quantitative Methods for Business", 8th edition, Thomson Learning, 2002.
3. Winston, "Operation Research", 4th edition, Brooks, 2003.
4. Vohra, "Quantitative Techniques in Management", 5th edition, Tata Mc Graw Hill, 2017.

EVALUATION PATTERN:

Continuous Internal Assessments					
Assessment I (100 Marks)		**Assessment II (100 Marks)**		**Total Internal Assessments**	**End Semester Examinations**
Individual Assignment / Seminar / MCQ	Written Test	Individual Assignment / Seminar / MCQ	Written Test		
40	**60**	**40**	**60**	**200**	**100**
Total				**40**	**60**
				100	

*Role Play / Group Discussions / Debates / Oral Presentations / Poster Presentations / Technical presentations can also be provided. Course Coordinator can choose any one / two components based on the nature of the course.

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