Syllabus for B.E III - Semester for academic year 2022 – 2023

(For students admitted to II year in 2022-23, common to all branches)

21UMA300M	**Bridge Course Mathematics-I**	**Mandatory - Credits (3 : 0 : 0)**
Hours / Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

10 Hrs.

Differential Calculus:

Review of elementary calculus, Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation. Taylor’s and Maclaurin’s series expansions for one variable (without proof) problems

10 Hrs.

Partial differentiation: Introduction to function of several variables, Partial derivatives; Euler’s theorem - problems. Total derivatives-differentiation of composite functions. Jacobians-problems

10 Hrs.

Integral Calculus:

Multiple integrals: Evaluation of double and triple integrals. Area bounded by the curve.

Beta and Gamma functions: Definitions, Relation between beta and gamma functions-problems.

10 Hrs.

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative; curl and divergence-physical interpretation; solenoidal and irrotational vector fields- problems

References:

1. Maurice D weir, Joel Hass and Frank R. Giordano, “Thomas calculus”, Pearson, eleventh edition, 2011
2. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
3. B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Erwin Kreyszing’s Advanced Engineering Mathematics volume1 and volume1I,wiley India Pvt.Ltd.,2014

Course Objectives:

This course will enable students to

1. Enhance learning of Engineering Mathematics.
2. Develop, understanding, stimulate their interest, and increase their proficiency in Mathematics.
3. Visualizing and representations: learners can see abstract concepts; make connections between geometry and algebra.
4. Make our teaching modules more active and improve the learning outcomes of our students.

5. Learn Engineering Mathematics conceptually and relationally in order to be able to apply, when they have learned.
6. Create inquiry based learning and an opportunity to learn, practice.

Course Outcomes:

At the end of the course the student should be able to,

1. Apply the concepts of polar curves to solve Engineering problems
2. Apply the knowledge of partial differentiation to solve Engineering problems.
3. Apply the concepts of multiple integrals and their usage in computing the area and volumes.
4. Evaluate improper integrals using beta and gamma functions.
5. Apply the knowledge of differentiation of vectors to solve the engineering problems.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
No	**Programme Outcomes** **Course Outcomes**															
The students will be able to:																
1	Apply the concepts of polar curves to solve Engineering problems	3	2													
2	Apply the knowledge of partial differentiation to solve Engineering problems.	3	2													
3	Apply the concepts of multiple integrals and their usage in computing the area and volumes.	3	2													

4	Evaluate improper integrals using beta and gamma functions.	3	2													
5	Apply the knowledge of differentiation of vectors to solve the engineering problems.	3	2													

Competencies Addressed in the course and Corresponding Performances Indicators
Programme Outcomes: Any of 1 to 12 Po's:

Competency	Indicators
1.1Apply the knowledge of basic principles and Mathematics to the solution of Engineering problems	1.1.1 Apply the knowledge of polar curves in different engineering fields.
	1.1.2 Apply the knowledge of Partial differentiation to solve engineering Problems.
	1.1.3 Apply the knowledge of Multiple Integral, to solve engineering Problems.
	1.1.4 Apply the knowledge of beta and gamma functions in different engineering fields.
	1.1.5 Apply the concept of differentiation of vectors, to solve Engineering Problems.

Example: 1.2.3: Represents program outcome '1' , competency '2' , & performance indicator '3' .

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	1	2	--	--	--	--	--	--	--	--	--	--
CO2	1	2	--	--	--	--	--	--	--	--	--	--
CO3	1	2	--	--	--	--	--	--	--	--	--	--
CO4	1	2	--	--	--	--	--	--	--	--	--	--
CO5	1	2	--	--	--	--	--	--	--	--	--	--

Syllabus for B.E III - Semester for academic year 2022 – 2023

(For students admitted to II year in 2022-23, common to all branches)

Evaluation Scheme:

Assessment	Marks	Weightage
CIE-I	**40**	**20**
CIE-II	**40**	**20**
Assignments/ Quizzes/Case Study/ Course Project/ Term Paper/Field Work	**10**	**10**
SEE	**100**	**50**
Total	**190**	**100**

Question paper pattern for CIE-I and CIE-II:

1. Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering two units (no multiple choice questions and No true or false questions).
2. In Part-B, any TWO full questions are to be answered.

CIE	Number of questions / Maximum marks	Sub divisions	Contents
I	Four questions of 15 marks (Solve any two)	Sub divisions shall not be mixed with Differential Calculus & Partial differentiation	**Differential Calculus**
		Sub divisions shall not be mixed with Differential Calculus & Partial differentiation	**Partial differentiation**
II	Four questions of 15 marks (Solve any two)	Sub divisions shall not be mixed with Integral Calculus ,Beta and Gamma functions & Vector Differentiation	**Integral Calculus & Beta and Gamma functions**
		Sub divisions shall not be mixed with Integral Calculus ,Beta and Gamma functions & Vector Differentiation	**Vector Differentiation**

Question paper pattern for SEE:

1. Question paper consists Part-A and Part-B. Part A is compulsory , it consists of short answer questions of 1 or 2 marks, covering entire syllabus (no multiple choice questions and No true or false questions, 50% of questions must be L3 and L4 level).
2. In Part-B total eight questions, any FOUR full questions are to be answered. Uniformly covering the entire syllabus.
3. Each question carries 20 marks and should not have more than four subdivisions.

4. Sketches, figures and tables if any should be clearly drawn, as the same is scanned for printing.
5. The question paper should contain all the data / figures / marks allocated, with clarity.

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT
DEPARTMENT OF MATHEMATICS
FIRST CIE (Model question Paper)

Course	**: B.E**	**Semester**	**:III**
Subject	**: Bridge course Mathematics-I**	**Branch**	**:Common to all**
Subject Code	**: 21UMA300M**	**Max. Marks**	**: 40**
Date:		**Time**	**:**

Note:PART A: ALL questions are compulsory. PART B :Answer any TWO full question

PART-A

Q. No.	**Question**	**MARKS**	**BL**	**CO**	**PI**
1. a.	Write the relationship between the Cartesian and polar coordinate systems.	2	L2	1	1.1.1
b.	Define the angle between two polar curves.	2	L1	1	1.1.1
c.	Define partial differentiation.	2	L3	1	1.1.2
d.	If $u = \tan^{-1}\left(\frac{y}{x}\right)$, then find $\frac{\partial^2 u}{\partial y \partial x}$.	2	L2	2	1.1.2
e.	Obtain the Maclaurin's expansion of $f(\mathrm{x}) = a^x$	2	L1	1	1.1.2
	PART -B				
2. a.	Derive the angle between radius vector and the tangent to the curve $r = f(\theta)$ at any point P(r , θ) in the form $tan\emptyset = r\frac{d\theta}{dr}$.	5	L3	1	1.1.1
b.	Find the angle between radius vector and the tangent to the curve r = a (1-cosθ). Also find the slope of the curve at θ = π/6.	5	L2	1	1.1.1
c.	Show that the following curves intersect orthogonally $r = ae^{\theta}$ & $re^{\theta} = b$	5	L2	1	1.1.1
3a.	Find the angle of intersection of curves r = sinΘ + cosΘ and r = 2sinΘ	5	L2	1	1.1.1
b.	Find the pedal equation of the curve r = a (1+cosθ).	5	L2	1	1.1.1

c.	Obtain the Taylor's expansion of $\log_e x$ about x = 1 up to the term containing 4th degree and hence find $\log_e(1.1)$	5	L2	1	1.1.1
4. a.	If $z = x^3 - 3xy^2 + x + e^y \cos y + 1, then\, show\, that\, \frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$	5	L2	2	1.1.1
b.	If $u = f(x + ct) + g(x - ct)$ prove that $u_{tt} = c^2 u_{xx}$	5	L1	2	1.1.2
c.	Verify that $\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x}$ for the function $z = x\sin y + y\sin x$.	5	L3	2	1.1.2
5. a.	If $z = \frac{x^2 + y^2}{x + y} then\, show\, that \left[\frac{\partial z}{\partial x} - \frac{\partial z}{\partial y}\right]^2 = 4\left[1 - \frac{\partial z}{\partial x} - \frac{\partial z}{\partial y}\right]$	5	L2	2	1.1.2
b.	If z = f(x,y) where $x = e^u + e^{(-v)}$ and $y = e^{(-u)} - e^v$, then prove that $\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v} = \mathbf{x}\frac{\partial z}{\partial x} - \mathbf{y}\frac{\partial z}{\partial y}$.	5	L3	2	1.1.2
c.	Find the Jacobian of u,v,w with respect to x,y,z given u = x + y + z, v= y+z, w = z	5	L3	2	1.1.2

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT
DEPARTMENT OF MATHEMATICS
Second- CIE (Model question Paper)

Course	**: B.E**	**Semester**	**: III**
Subject	**: Bridge course Mathematics-I**	**Branch**	**: Common to all**
Subject Code	**: 21UMA300M**	**Max. Marks**	**: 40**
Date:		**Time**	**:**

Note:PART A: ALL questions are compulsory. PART B :Answer any TWO full question

PART-A

Q. No.	**Question**	**MARKS**	**BL**	**CO**	**PI**
1. a.	**Evaluate** $\int_0^1\int_0^1 dx\, dy.$	2	L2	3	1.1.2

b.	**Evaluate** $\int_0^1\int_0^1\int_0^1 dz\,dx\,\mathrm{dy}$	2	L1	3	1.1.2
c.	Define beta function	2	L3	4	1.1.2
d.	Define velocity of a vector function $\vec{r} = \vec{f}(\mathrm{t})$	2	L2	3	1.1.3
e.	Define acceleration of a vector function $\vec{r} = \vec{f}(\mathrm{t})$	2	L1	4	1.1.5
	PART -B				
2. a.	Evaluate $\int_0^1\int_0^1 x^3 y\ dx\ dy$	5	L3	3	1.1.2
b.	Evaluate $\int_0^1\int_0^x (x+y)dydx$	5	L2	3	1.1.2
c.	Evaluate $\int_{-c}^{c}\int_{-b}^{b}\int_{-a}^{a}\left(x^2+y^2+z^2\right)dz\,dy\,dx$	5	L2	3	1.1.2
3a.	**Prove that** $\beta(m,n)=\dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$	5	L2	4	1.1.2
b.	**Prove that** $\Gamma(1/2)=\sqrt{\pi}$	5	L2	4	1.1.2
c.	Evaluate $\int_0^{\pi/2}\sin^5\theta\cos^7\theta\,\mathrm{d}\theta$	5	L2	4	1.1.3
4. a.	If $r(\mathrm{t})=(\mathrm{acost})\mathrm{i}+(\mathrm{asint})\,\mathrm{j}+(\mathrm{ct})\,\mathrm{k}$, where a and c are scalar constants, then find $\dfrac{dr}{dt},\dfrac{d^2r}{dt^2}\ and\ \dfrac{d^3r}{dt^3}$	5	L2	5	1.1.3
b.	Find the unit tangent vector to the curve $\vec{r}(\mathrm{t})=(\cos t)\mathrm{i}+(\mathrm{sint})\,\mathrm{j}+(\mathrm{t})\,\mathrm{k}$.	5	L1	5	1.1.3
c.	A particle moves along the curve $x=1-t^3, y=1+t^2, z=2t-5$. Determine Its velocity and acceleration. Find the components of velocity and acceleration at t = 1 in the direction of 2i +j +2k .	5	L3	5	1.1.3

5. a.	Find the directional derivative of the $\varphi = x^2 y z + 4 x z^2$ at (1, -2, -1) along 2i – j – 2k .	5	L2	5	1.1.5
b.	Find Curl (Curl A) given that $A = xy\, i + y^2 z\, j + z^2 y\, k$.	5	L3	5	1.1.5
c.	Prove that $F = (6xy+z^3)I + (3x^2-z)\, j + (3xz^2-y)k$ is irrotational & find the scalar potential given $F = \nabla\varphi$.	5	L3	5	1.1.5

B.E. Third Semester End Examination, 2022-2023
SEE-Model Question paper

Course	**: B.E**	**Semester**	**: III**
Subject	**: Bridge course Mathematics-I**	**Branch**	**: Common to all**
Subject Code	**: 21UMA300M**	**Max. Marks**	**: 100**
Date:		**Time**	**:**
Duration	**: 3 Hours**		

Q.No.		**Question**	**Marks**	**BLL**	**CO**	**PI**
1	a	Write the relationship between the Cartesian and polar coordinate systems.	2	L2	1	1.1.1
	b	Define the angle between two polar curves.	2	L1	1	1.1.1
	c	Define partial differentiation.	2	L3	1	1.1.2
	d	If $u = x^3 y^4$, then find $\frac{\partial^2 u}{\partial y \partial x}$.	2	L2	2	1.1.2
	e	Obtain the Maclaurin's expansion of $f(x) = a^x$	2	L1	1	1.1.2
	f	State Euler's theorem on homogeneous function.	2	L2	2	1.1.2
	g	Define beta function.	2	L1	4	1.1.2
	h	If x = rcosΘ and y = rsinΘ then find $\frac{\partial(x, y)}{\partial(r, \theta)}$.	2	L3	2	1.1.2
	i	**Evaluate** $\int_0^1 \int_0^1 dx\, dy.$	2	L2	3	1.1.3
	j	Define velocity and acceleration of a vector function $\vec{r} = \vec{f}(t)$	2	L1	5	1.1.4
2	a	Derive the angle between radius vector and the tangent to the curve $r = f(\theta)$at any point P(r , θ) in the form $\tan\emptyset = r\frac{d\theta}{dr}$.	6	L3	1	1.1.1

	b	Find the angle between radius vector and the tangent to the curve r = a (1-cosθ). Also find the slope of the curve at θ = π/6.	7	L2	1	1.1.1
	c	Show that the following curves intersect orthogonally $r = ae^{\theta}$ & $re^{\theta} = b$	7	L2	1	1.1.1
3	a	Find the angle of intersection of curves r = sinΘ +cosΘ and r = 2sinΘ	6	L2	1	1.1.1
	b	Find the pedal equation of the curve r = a (1+cosθ).	7	L2	1	1.1.1
	c	Obtain the Taylor's expansion of $\log_e x$ about x = 1 up to the term containing 4th degree and hence find $\log_e(1.1)$	7	L2	1	1.1.1
4	a	If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, $show\,that \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = \frac{3}{x+y+z}$	6	L2	2	1.1.2
	b	If $u = f(x + ct) + g(x - ct)$ prove that $u_{tt} = c^2 u_{xx}$	7	L1	2	1.1.2
	c	if $x^x y^y z^z = c, then\,show\,that\ \frac{\partial^2 z}{\partial x \partial y} = -(\text{xlogex})^{-1}$, at x = y = z .	7	L3	2	1.1.2
5	a	If $z = \frac{x^2 + y^2}{x + y} then\,show\,that \left[\frac{\partial z}{\partial x} - \frac{\partial z}{\partial y}\right]^2 = 4\left[1 - \frac{\partial z}{\partial x} - \frac{\partial z}{\partial y}\right]$	6	L2	2	1.1.2
	b	if $u = u(\text{x}-\text{y}, \text{y}-\text{z}, \text{z}-\text{x})$ then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$	7	L3	2	1.1.2
	c	Find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ where $u = x^2 + y^2 + z^2$ $v = xy + yz + zx$, $w = x + y + z$	7	L3	2	1.1.2
6	a	Evaluate $\int_0^1 \int_0^1 x^3 y \, dx \, dy$	6	L3	3	1.1.3
	b	Evaluate $\int_0^1 \int_0^x (x + y) dy dx$	7	L2	3	1.1.3
	c	Evaluate $\int_{-c}^{c} \int_{-b}^{b} \int_{-a}^{a} \left(x^2 + y^2 + z^2\right) dz\, dy\, dx$	7	L2	3	1.1.3

7	a	**Prove that** $\beta(m,n)=\dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$	6	L2	4	1.1.4
	b	**Prove that** $\Gamma(1/2)=\sqrt{\pi}$	7	L2	4	1.1.4
	c	Evaluate $\int_0^{\pi/2} \sin^5\theta\cos^7\theta\, d\theta$	7	L2	4	1.1.4
8	**a**	If $r(\mathrm{t})=(\mathrm{acost})\mathrm{i}+(\mathrm{asint})\mathrm{j}+(\mathrm{ct})\mathrm{k}$, where a and c are scalar constants, then find $\dfrac{dr}{dt},\dfrac{d^2r}{dt^2}$ *and* $\dfrac{d^3r}{dt^3}$	6	L2	5	1.1.5
	b	Find the unit tangent vector to the curve $\vec{r}(\mathrm{t})=(\cos t)\mathrm{i}+(\mathrm{sint})\mathrm{j}+(\mathrm{t})\mathrm{k}$.	7	L1	5	1.1.5
	c	A particle moves along the curve $x=1-t^3, y=1+t^2, z=2t-5$. Determine Its velocity and acceleration. Find the components of velocity and acceleration at t = 1 in the direction of 2i +j +2k .	7	L3	5	1.1.5
9	**a**	Find the directional derivative of the $\varphi = x^2 y z + 4 x z^2$ at (1, -2, -1) along 2i – j – 2k .	6	L2	5	1.1.5
	b	Find Curl (Curl A) given that A= xy i + y^2 z j +z^2 y k .	7	L3	5	1.1.5
	c	Prove that F = $(6xy+z^3)I + (3x^2-z)j + (3xz^2-y)k$ is irrotational & find the scalar potential given F =∇φ.	7	L3	5	1.1.5

Syllabus for B.E III - Semester for academic year 2022 – 2023

(For students admitted to I year in 2021-22, CS, IS, AIML and EC)

21UMA301C	**NUMERICAL TECHNIQUES AND INTEGRAL TRANSFORMS**	**03 - Credits (3 : 0 : 0)**
Hours / Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	**10 Hrs.**
Numerical Analysis-I Introduction to root finding problems, Bisection Method, Newton-Raphson method. Finite differences, forward and backward difference operators (no derivations on relations between operators) Newton-Gregory forward and backward interpolation formulae. (Without proof), Lagrange's and Newton's divided difference interpolation formulae (without proof).	
UNIT – II	**10 Hrs.**
Numerical Analysis-II Numerical differentiation using Newton's forward and backward formulae-problems. Trapezoidal rule, Simpson's one third rule, Simpson's three eighth rule and Weddle's rule (no derivation of any formulae)-problems. Euler's and Modified Euler's method, Runge-Kutta 4th order method.	
UNIT – III	**10 Hrs.**
Fourier series Periodic functions, Conditions for Fourier series expansions, Fourier series expansion of continuous and functions having finite number of discontinuities, even and odd functions. Half-range series, practical harmonic analysis.	
UNIT – IV	**10 Hrs.**
Fourier transforms and z-transforms Infinite Fourier transforms and inverse Fourier transforms- simple properties, Fourier sine and Fourier cosine transforms, Inverse Fourier sine and cosine transforms. Z-transforms-definition, standard forms, linearity property, damping rule, shifting rule-problems. Inverse Z-transforms.	

References:

1. Numerical Methods for Engineers by Steven C Chapra &Raymond P Canale.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
3. Advanced Engineering Mathematics By H. K. Das, S. Chand & company Ltd. Ram Nagar, New Delhi
4. Advanced Engineering Mathematics by E Kreyszig ,John Wiley & Sons.

Course Objectives:

1. To understand the numerical methods of solving algebraic, transcendental equations.
2. To acquired the knowledge about various methods of interpolation
3. To understand the basic concepts of numerical differentiation, numerical integration and numerical solutions of ordinary differential equations.
4. To understand concepts of Fourier series, Fourier transforms, and z-transforms.

Course Outcomes:

After completion of the course the students shall be able to,

1. Solve engineering problems using non-linear equations and interpolation techniques.
2. Solve problems using numerical differentiation and numerical integration.
3. Solve ordinary differential equations using numerical methods.
4. Solve Problems using the Fourier series.
5. Solve problems using the basic concepts of Fourier transforms and z –transforms.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
No	**Programme Outcomes Course Outcomes**															
The students will be able to:																
1	Solve engineering problems using non-linear equations and interpolation techniques.	3	2													
2	Solve problems using numerical differentiation and numerical integration.	3	2													
3	Solve ordinary differential equations using numerical methods.	3	2													
4	Solve Problems using the Fourier series.	3	2													
5	Solve problems using the basic concepts of Fourier transforms and z –transforms.	3	2													

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	1	2	--	--	--	--	--	--	--	--	--	--
CO2	1	2	--	--	--	--	--	--	--	--	--	--
CO3	1	2	--	--	--	--	--	--	--	--	--	--
CO4	1	2	--	--	--	--	--	--	--	--	--	--
CO5	1	2	--	--	--	--	--	--	--	--	--	--

Assessment	**Marks**	**Weightage**
CIE-I	40	20
CIE-II	40	20
Assignments/ Quizzes/Case Study/ Course Project/ Term Paper/Field Work	10	10
SEE	100	50
Total	**190**	**100**

Question paper pattern for CIE-I and CIE-II:

Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering Unit-I and Unit-II (no multiple choice questions and No true or false questions).

1. In Part-B, four questions are to be set as per the following table.

CIE	**Number of questions / Maximum marks**	**Sub divisions**	**Covering entire unit**
I	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-I
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-II
II	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-III
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-IV

Question paper pattern for SEE:

1. Question paper consists Part-A and Part-B. Question number 1 is compulsory, it consists of short answer questions of 1 or 2 marks, covering entire syllabus (no multiple choice questions and No true or false questions, 50% of questions must be L3 and L4 level).
2. In Part-B total of eight questions with two from each unit; with internal choice to be set uniformly covering the entire syllabus.
3. Each question carries 20 marks and should not have more than four subdivisions.
4. In Part-B, any FOUR full questions are to be answered choosing at least one from each unit.
5. Sketches, figures and tables if any should be clearly drawn, as the same is scanned for printing.
6. The question paper should contain all the data / figures / marks allocated, with clarity.

Syllabus for B.E III - Semester for academic year 2022 – 2023

(For students admitted to I year in 2021-22, CV, ME, IP & BT)

21UMA302C	**NUMERICAL TECHNIQUES AND FOURIER SERIES**	**03 - Credits (3 : 0 : 0)**
Hours / Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	**10 Hrs.**

Numerical Methods-I:
Introduction to root finding problems, Newton-Raphson method. Finite differences, forward and backward difference operators (no derivations on relations between operators) Newton-Gregory forward and backward interpolation formulae. (Without proof), Lagrange's and Newton's divided difference interpolation formulae (without proof) Numerical differentiation using Newton's forward and backward formulae-problems.

UNIT – II	**10 Hrs.**

Numerical Methods -II:
Numerical Integration: Simpson's one third rule, Simpson's three eighth rule waddles' (no derivation of any formulae)-problems. Numerical solution of ODE: Taylors, Euler's and Modified Euler's method, Runge-Kutta 4th order method, miles Predictor corrector method.

UNIT – III	**10 Hrs.**

Fourier series:
Periodic functions, Conditions for Fourier series expansions, Fourier series expansion of continuous and functions having finite number of discontinuities, even and odd functions. Half-range series, practical harmonic analysis.

UNIT – IV	**10 Hrs.**

Fourier transforms:
Infinite Fourier transforms and inverse Fourier transforms- simple properties, Fourier sine and Fourier cosine transforms. Inverse Fourier sine and cosine transforms.

References:

1. Numerical Methods for Engineers by Steven C Chapra &Raymond P Canale.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
3. Advanced Engineering Mathematics By H. K. Das, S. Chand & company Ltd. Ram Nagar, New Delhi
4. Advanced Engineering Mathematics by E Kreyszig ,John Wiley & Sons.

Learning Objectives:

1. To understand the numerical methods of solving algebraic and transcendental equations.
2. To acquire the knowledge of interpolation techniques.
3. To understand the basic concepts of numerical differentiation, numerical integration and numerical solution of ordinary differential equations.
4. To understand concepts of Fourier series, and Fourier transforms.

Course Outcomes:

After completion of the course the students shall be able to,

1. Solve engineering problems using non-linear equations and interpolation techniques.
2. Solve problems using numerical differentiation and numerical integration.
3. Solve ordinary differential equations using numerical methods.
4. Solve Problems using the Fourier series.
5. Solve problems using the basic concept of Fourier transforms.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
No	**Programme Outcomes Course Outcomes**															
The students will be able to:																
1	Solve engineering problems using non-linear equations and interpolation techniques.	3	2													
2	Solve problems using numerical differentiation and	3	2													

	numerical integration.															
3	Solve ordinary differential equations using numerical methods.	3	2													
4	Solve Problems using the Fourier series.	3	2													
5	Solve problems using the basic concept of Fourier transforms.	3	2													

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	1	2	--	--	--	--	--	--	--	--	--	--
CO2	1	2	--	--	--	--	--	--	--	--	--	--
CO3	1	2	--	--	--	--	--	--	--	--	--	--
CO4	1	2	--	--	--	--	--	--	--	--	--	--
CO5	1	2	--	--	--	--	--	--	--	--	--	--

Evaluation Scheme:

Assessment	**Marks**	**Weightage**
CIE-I	40	20
CIE-II	40	20
Assignments/ Quizzes/Case Study/ Course Project/Term Paper/Field Work	10	10
SEE	100	50
Total	**190**	**100**

Question paper pattern for CIE-I and CIE-II:

1. Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering Unit-I and Unit-II (no multiple choice questions and No true or false questions).
2. In Part-B answer any two full questions selecting at least one from each unit (four questions are to be set as per the following table).

CIE	Number of questions / Maximum marks	Sub divisions	Unit
I	Two questions of 15 marks(Solve any one)	Sub divisions shall not be mixed within the unit	Unit-I
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-II
II	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-III
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-IV

Question paper pattern for SEE:

1. Question paper consists Part-A and Part-B. Part-A is compulsory, it consists of short answer questions of 1 or 2 marks, covering entire syllabus (no multiple choice questions and No true or false questions, 50% of questions must be L3 and L4 level).
2. In Part-B total of eight questions with two from each unit; with internal choice to be set uniformly covering the entire syllabus.
3. Each question carries 20 marks and should not have more than four subdivisions.
4. In Part-B, any FOUR full questions are to be answered choosing at least one from each unit.
5. Sketches, figures and tables if any should be clearly drawn, as the same is scanned for printing.
6. The question paper should contain all the data / figures / marks allocated, with clarity.

Syllabus for B.E III - Semester for academic year 2022 – 2023

(For students admitted to I year in 2021-22, EEE)

21UMA303C	**Computation Techniques for Electrical System -I**	**03 - Credits (3 : 0 : 0)**
Hours / Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I

10 Hrs.

Introduction:

Definitions of signals and systems, Classification of signals, Elementary signals, Basic operations on signals, Properties of systems.

UNIT – II

10 Hrs.

Time-domain representation for LTI systems:

Convolution, Impulse response representation, Properties of impulse response representation, Block diagram representations

UNIT – III

10 Hrs.

Z-Transforms:

Introduction, Z transform, Properties of ROC, Properties of the Z - transform, Inverse Z - transform, Partial fraction expansion method, Transfer function, Causality and Stability

UNIT – IV

10 Hrs.

Fourier Analysis of Continuous Time Periodic and Aperiodic signals:

Introduction, Properties of continuous-time Fourier series (Excluding derivation of defining equations for CTFS), Linearity, Time shift, Frequency shift, Scaling, Differentiation and Integration, Convolution and Modulation, Parseval’s theorem and problems on properties of Fourier series and Fourier transform.

References:

1. Simon Haykin and Bary Vam Veen, "Signals and Systems," John Wiely and Sons, 2nd Edition, 2014.
2. H P HSU, "Signals and Systems," Schaums Outline, TMH, 2nd Edition, 2011.
3. Michael Roberts, “Fundamentals of Signals & Systems”, 2nd Edition, Tata McGraw-Hill, 2010
4. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, “Signals and Systems” Pearson Education Asia / PHI, 2nd Edition, 2013.
5. Ganesh Rao, Satish Tunga, “Signals and Systems”, Sanguine Technical Publishers, 2nd Edition, 2020.

Course Outcomes:

After completion of the course the students shall be able to,

1. Represent signals and perform the basic operations on signals and to identify systems properties on causality, stability, memory, linearity and time invariance **(BLL 1)**
2. Illustrate- Continuous time systems and discrete time system by performing Convolution in LTI system with properties of impulse response **(BLL 2)**
3. Analyze and Derive the Z transforms and properties of Z transform by using the concept of ROC **(BLL 3)**
4. Determine Fourier series and properties of Fourier series in CTFS and CTFT signals **(BLL 4)**

Course Outcomes - Programme Outcomes Mapping Table

Sl.	**Course Outcomes**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
1	Students shall be able to Represent signals and perform the basic operations on signals and to identify systems properties on causality, stability memory, linearity, and time invariance.	**2**	**3**										**1**
2	Students shall be able to illustrate Continuous time system and discrete time system by performing Convolution in LTI system and with properties of impulse response.	**3**	**1**	**2**	**1**								**1**
3	Students shall be able to Analyze and Derive the Z transforms and properties of Z transform by using the concept of ROC.	**3**	**3**	**1**	**1**								**1**
4	Students shall be able to Determine Fourier series and properties of Fourier series in CTFS signals.	**3**	**3**	**2**	**2**								**1**
5	Students shall be able to Determine Fourier series and	**3**	**3**	**2**	**2**								**1**

	properties of Fourier series in CTFT signals.												

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	2	3	--	--	--	--	--	--	--	--	--	1
CO2	3	1	2	1	--	--	--	--	--	--	--	1
CO3	3	3	1	1	--	--	--	--	--	--	--	1
CO4	3	3	2	2	--	--	--	--	--	--	--	1
CO5	3	3	2	2	--	--	--	--	--	--	--	1

Evaluation Scheme:

Assessment	**Marks**	**Weightage**
CIE-I	40	20
CIE-II	40	20
Assignments/ Quizzes/Case Study/ Course Project/ Term Paper/Field Work	10	10
SEE	100	50
Total	**190**	**100**

Question paper pattern for CIE-I and CIE-II:

Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering Unit-I and Unit-II (no multiple choice questions and No true or false questions).

1. In Part-B, four questions are to be set as per the following table.

CIE	Number of questions / Maximum marks	Sub divisions	Covering entire unit
I	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-I
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-II
II	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-III
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-IV

Question paper pattern for SEE:

1. Question paper consists Part-A and Part-B. Question number 1 is compulsory, it consists of short answer questions of 1 or 2 marks, covering entire syllabus (no multiple choice questions and No true or false questions, 50% of questions must be L3 and L4 level).
2. In Part-B total of eight questions with two from each unit; with internal choice to be set uniformly covering the entire syllabus.
3. Each question carries 20 marks and should not have more than four subdivisions.
4. In Part-B, any FOUR full questions are to be answered choosing at least one from each unit.
5. Sketches, figures and tables if any should be clearly drawn, as the same is scanned for printing.
6. The question paper should contain all the data / figures / marks allocated, with clarity.

Syllabus for B.E IV - Semester for academic year 2022 – 2023

(For students admitted to II year in 2022-23, common to all branches)

21UMA400M	**Bridge Course Mathematics-II**	**Mandatory - Credits (3 : 0 : 0)**
Hours / Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

10 Hrs.

Differential Equations-1:

Ordinary differential equations of first order**:** Variable separable, Homogeneous. Exact form and reducible to exact differential equations. Linear and Bernoulli's equation.

10 Hrs.

Differential Equations-2:

Second and higher order linear ODE's with constant coefficients-Inverse differential operator, method of variation of parameters (second order); Cauchy's and Legendre homogeneous equations.

10 Hrs.

Laplace Transform:

Introduction, Definition of Laplace Transform, Laplace Transform of standard functions, Properties: Shifting, differentiation, Integral and division by t. Periodic function, Heaviside's Unit step function.

10 Hrs.

Inverse Laplace transforms:

Properties, Convolution theorem-problems, Solutions of linear differential equations.

References:

1. B.S. Grewal : Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin Kreyszing's Advanced Engineering Mathematics volume I and volume II, wiley India Pvt.Ltd., 2014.
3. Elementary Differential Equations by Earl D. Rainville and Phillip E, Bedient, Sixth Edition
4. Erwin Kreyszing's Advanced Engineering Mathematics,wiley India Pvt.Ltd.,2014.

Course Objectives:

This course will enable students to

1. Enhance learning of Engineering Mathematics.
2. Study basic concepts of differential equations and Laplace transforms

Course Outcomes:

At the end of the course the student should be able to,

1. Solve first order first degree differential equations.
2. Solve second and higher order linear differential equations.
3. Apply Laplace transforms for standard functions and its properties
4. Apply Inverse Laplace transforms for standard functions
5. Solve differential equations using Laplace transform method.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
No	**Programme Outcomes Course Outcomes**															
The students will be able to:																
1	Solve first order first degree differential equations.	3	2													
2	Solve second and higher order linear differential equations.	3	2													
3	Apply Laplace transforms for standard functions and its properties	3	2													
4	Apply Inverse Laplace transforms for standard functions	3	2													
5	Solve differential equations using Laplace transform method.	3	2													

Competencies Addressed in the course and Corresponding Performances Indicators Programme Outcomes: Any of 1 to 12 Po's:

Competency	Indicators
1.1Apply the knowledge of basic principles and Mathematics to the solution of Engineering problems	1.1.1 Apply the knowledge first order first degree differential equations in different engineering fields.
	1.1.2 Apply the knowledge of second and higher order linear differential equations to solve engineering Problems.
	1.1.3 Apply the knowledge of Laplace transforms, to solve engineering Problems.
	1.1.4 Apply the knowledge of Inverse Laplace transforms in different engineering fields.
	1.1.5 Apply the concept of Laplace transforms, to solve differential equations.

Example: 1.2.3: Represents program outcome '1', competency '2' , & performance indicator '3' .

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2	--	--	--	--	--	--	--	--	--	--
CO2	3	2	--	--	--	--	--	--	--	--	--	--
CO3	3	2	--	--	--	--	--	--	--	--	--	--
CO4	3	2	--	--	--	--	--	--	--	--	--	--
CO5	3	2	--	--	--	--	--	--	--	--	--	--

Evaluation Scheme:

Assessment	Marks	Weightage

Syllabus for B.E IV - Semester for academic year 2022 – 2023

(For students admitted to II year in 2022-23, common to all branches)

CIE-I	40	20
CIE-II	40	20
Assignments/ Quizzes/Case Study/ Course Project/Term Paper/Field Work	10	10
SEE	100	50
Total	190	100

Question paper pattern for CIE-I and CIE-II:

1. Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering two units (no multiple choice questions and No true or false questions).
2. In Part-B, any TWO full questions are to be answered.

CIE	Number of questions / Maximum marks	Sub divisions	Contents
I	Four questions of 15 marks (Solve any two)	Sub divisions shall not be mixed with Differential equations-1 and Differential equations-2	**Differential Equations-1**
		Sub divisions shall not be mixed with Differential equations-1 and Differential equations-2	**Differential Equations-2**
II	Four questions of 15 marks (Solve any two)	Sub divisions shall not be mixed with Laplace Transform and Inverse Laplace transform	**Laplace Transform**
		Sub divisions shall not be mixed with Laplace Transform and Inverse Laplace transform	**Inverse Laplace Transform**

Question paper pattern for SEE:

1. Question paper consists Part-A and Part-B. Question number 1 is compulsory, it consists of short answer questions of 1 or 2 marks, covering entire syllabus (no multiple choice questions and No true or false questions, 50% of questions must be L3 and L4 level).
2. In Part-B total of eight questions with two from each unit; with internal choice to be set uniformly covering the entire syllabus.
3. Each question carries 20 marks and should not have more than four subdivisions.
4. In Part-B, any FOUR full questions are to be answered.

Syllabus for B.E IV - Semester for academic year 2022 – 2023

(For students admitted to II year in 2022-23, common to all branches)

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT
DEPARTMENT OF MATHEMATICS
FIRST CIE (Model question Paper)

Course	**: B.E**	**Semester**	**:IV**
Subject	**: Bridge course Mathematics-II**	**Branch**	**:Common to all**
Subject Code	**: 21UMA400M**	**Max. Marks**	**: 40**
Duration :	1 ½ Hour	**Time**	**:**

Q. No	**Question**	**Marks**	**BL**	**CO**	**PI**
	PART-A Answer all Questions				
1 a	From the following ordinary differential equation write the order and degree i) $\frac{d^3y}{dx^3}+5\left(\frac{d^2y}{dx^2}\right)+\left(\frac{dy}{dx}\right)^3 = \sin x$, (ii) $\frac{d^2x}{dt^2}+\omega^2 x=0$	02	L3	2	1.1.2
b	Verify $x^2y\,dx-(x^3+y^3)\,dy=0.$ is it an exact differential equation or not.	02	L3	1	1.1.1
c	(dy/dx)+P y = Q , is it linear in y ,if your answer yes , what is the integrating factor.	02	L3	1	1.1.1
d	If $\pm 2i\ and\ 2,3$ are the roots of a given differential equation then what is the Complementary Function.	02	L3	2	1.1.2
e	If $D^2-4D+4=e^{2x}$ where D=d/dx, then Particular Integral of this equation is	02	L3	2	1.1.2
	PART-B Answer Any Two full Questions				
2 a	Solve dy/dx = (x - 1)(y - 2)	05	L2	1	1.1.1
b	Solve dy/dx = (1-y/x)/(1+y/x)	05	L2	1	1.1.1

c	Solve $\left(2x+y+1\right)dx+\left(x+2y+1\right)dy=0$	05	L2	1	1.1.1
3 a	Solve $x\,dy-y\,dx=0$	05	L2	1	1.1.1
b	Solve $\frac{dy}{dx}+y\cot x=\cos x.$	05	L2	1	1.1.1
c	Solve $y'+4\,x\,y=x^3y^2$	05	L2	1	1.1.1
4 a	Solve $y''-9y=e^{2x}$	05	L3	1	1.1.1
b	Solve $y^{(3)}-5y''-22y'+56\,y=0$	05	L3	1	1.1.1
c	Solve $y^{(4)}+16\,y=0$	05	L2	2	1.1.2
5 a	Solve y'' + y = sec x by the method of variation of parameters.	05	L3	1	1.1.1
b	Solve $x^2\,y''-6xy'-18y=0$ by Cauchy method	05	L3	2	1.1.2
c	Solve $(1-x^2)d^2y/dx^2-2x\,dy/dx+6y=0$ by Legendres method	05	L3	2	1.1.2

Syllabus for B.E IV - Semester for academic year 2022 – 2023

(For students admitted to II year in 2022-23, common to all branches)

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT
DEPARTMENT OF MATHEMATICS
Second CIE (Model question Paper)

Course	**: B.E**	**Semester**	**: IV**
Subject	**: Bridge course Mathematics-II**	**Branch**	**: Common to all**
Subject Code	**: 21UMA400M**	**Max. Marks**	**: 40**
Duration :	1 ½ Hour	**Time**	**:**

Q. No	**Question**	**Marks**	**BL**	**CO**	**PI**
	PART-A Answer all Questions				
1 a	Define Laplace Transform	02	L1	3	1.1.3
b	Find L(2000)	02	L1	3	1.1.3
c	Find $L\left[e^{at}\right]$	02	L2	3	1.1.3
d	Find $L^{-1}\left[\frac{1}{s^3}\right]$	02	L2	4	1.1.4
e	Find $L^{-1}\left[\frac{e^{-3s}}{s^5}\right]$	02	L2	4	1.1.4
	PART-B Answer Any Two full Questions				
2 a	Find the Laplace Transform of $2+5t^3+4e^{-3t}+10e^t+\sin 2t$	05	L2	3	1.1.3

b	Find $L\{f(t)\}$ where $f(t)=\cos at\cos bt$	05	L2	3	1.1.3
c	Find $L\{\sin 2t.\cos 3t\}$	05	L2	3	1.1.3
3 a	Find $L\left\{\dfrac{e^{-at}-e^{-bt}}{t}\right\}$	05	L2	3	1.1.3
b	Find $L[e^{-2t}\sinh 4t]$	05	L2	3	1.1.3
c	Find $L[t^3\cosh t]$.	05	L2	3	1.1.3
4 a	Find $L^{-1}\left[\dfrac{s+2}{s^2+36}+\dfrac{4s-1}{s^2+25}\right]$	05	L3	4	1.1.4
b	Find $L^{-1}\left[\dfrac{1+e^{-3s}}{s^2}\right]$.	05	L3	4	1.1.4
c	Find $L^{-1}\left[\dfrac{s}{(s^2+a^2)^2}\right]$.	05	L2	4	1.1.4
5 a	Compute the inverse Laplace transform of 1/ (s+2)(s-3) .	05	L3	4	1.1.4
b	Evaluate $L^{-1}\left\{\dfrac{s}{(s^2+a^2)^2}\right\}$ by applying convolution theorem.	05	L3	4	1.1.4
c	Employ Laplace transform to solve the equation $y''+5y'+6y=5e^{2x}$, $y(0)=2$, $y'(0)=1$.	05	L3	5	1.1.5

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT

DEPARTMENT OF MATHEMATICS

Semester End Examination

(Model question Paper)

Course	**: B.E**	**Semester**	**: IV**
Subject	**: Bridge course Mathematics-II**	**Branch**	**: Common to all**
Subject Code	**: 21UMA400M**	**Max. Marks**	**: 100**
Duration :	3 Hour	**Time**	**:**

Syllabus for B.E IV - Semester for academic year 2022 – 2023

(For students admitted to II year in 2022-23, common to all branches)

Q.No.	**Question**	**Marks**	**BLL**	**CO**	**PI**
	PART A: COMPULSORY. Answer all questions.				
1. a.	From the following ordinary differential equation write the order and degree i) $\frac{d^3y}{dx^3}+5\left(\frac{d^2y}{dx^2}\right)+\left(\frac{dy}{dx}\right)^3=\sin x$ (ii) $\frac{d^2x}{dt^2}+\omega^2x=0$	**2**	**L2**	**2**	**1.1.2**
b.	$\frac{dy}{dx}+Py=Q$ what is the integrating factor of the given equation.	**2**	**L2**	**1**	**1.1.1**
c.	Verify $x^2y\,dx-(x^3+y^3)\,dy=0.$ is it an exact differential equation or not.	**2**	**L2**	**1**	**1.1.1**
d.	Solve: $(D^2+6D+9)y=0$.	**2**	**L3**	**2**	**1.1.2**
e.	Write the Particular Integral solution of $y''+2y'+y=e^{2x}$.	**2**	**L3**	**2**	**1.1.2**
f.	Find L (9000000)	**2**	**L2**	**3**	**1.1.3**
g.	Find $L[\cos 2x]$ and $L[\sinh 3x]$	**2**	**L2**	**3**	**1.1.3**
h.	Compute the inverse Laplace transform of (-2/5) (1/(s-(3/5))) .	**2**	**L2**	**4**	**1.1.4**
i.	Find $L^{-1}\left\{\frac{3}{2s+5}\right\}$	**2**	**L3**	**4**	**1.1.4**
j.	Compute the inverse Laplace transform of (s / (s^2 + 4)).	2	L2	4	1.1.4
	PART-B **Answer any FOUR full questions choosing at least one from each unit.**				
2. a.	Solve : dy/dx = (x - 1)(y - 2)	6	L2	1	1.1.1
b.	Solve : dy/dx = (1-y/x)/(1+y/x)	7	L3	1	1.1.1
c.	Solve : (2x + y + 1) dx + (x + 2y + 1)dy = 0	7	L3	1	1.1.1
3. a.	Solve : x dy – y dx = 0	6	L3	1	1.1.1
b.	Solve : $\frac{dy}{dx}+y\cot x=\cos x.$	7	L3	1	1.1.1
c.	Solve : $y'+4xy=x^3y^2$	7	L2	1	1.1.1
4. a.	Solve: $\frac{d^3y}{dx^3}+\frac{d^2y}{dx^2}+4\frac{dy}{dx}+4y=0.$	6	L3	2	1.1.2
b.	Solve $(D^3+4D)y=sin2x$	7	L3	2	1.1.2
c.	Solve $(D^4-1)y=e^xcosx$	7	L3	2	1.1.2

5. a.	Solve by the method of variation of parameters $y''-6y'+9y=\frac{e^{3x}}{x^2}$.	6	L3	2	1.1.2
b.	Solve: $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}+y=\log x$	7	L3	2	1.1.2
c.	Solve $(1+x)^2\frac{d^2y}{dx^2}+(1+x)\frac{dy}{dx}+y=2\sin[\log(1+x)]$	7	L3	2	1.1.2
6. a.	Find $L\{f(t)\}$ where $f(t)=\cos at\cos bt$.	6	L2	3	1.1.3
b.	Find $L\{f(t)\}$, if $f(t)=e^{3t}.\sin^2 t$				
c.	Find $L\left\{\frac{e^{-at}-e^{-bt}}{t}\right\}$.	7	L3	3	1.1.3
7. a.	Evaluate : $\int_0^\infty e^{-3t}\,t\sin t\,dt$.	6	L3	3	1.1.3
b.	If $f(t)=t^2$, $0<t<2$ and $f(t+2)=f(t)$ for $t>2$. Find $L\{f(t)\}$.	7	L2	3	1.1.3
c.	Express $f(t)=\begin{cases}1 & ,0<t\le 1\\ t & ,1<t\le 2\\ t^2 & ,t>2\end{cases}$ in terms of unit step functions and hence determine Laplace transform.		L2	3	1.1.3
8. a.	Find $L^{-1}\left\{\frac{2s}{s^2+9}\right\}$	6	L2	4	1.1.4
b.	Find $L^{-1}\left\{\frac{1}{s^2+2s+5}\right\}$.	7	L3	4	1.1.4
c.	Find $L^{-1}\left\{\log\left(\frac{s+a}{s+b}\right)\right\}$	7	L3	4	1.1.4
9. a.	Find the inverse Laplace transform of the following function $f(s)=\frac{4s^5+6s^2+10s+1}{s^6}$	6	L2	4	1.1.4
b.	Evaluate $L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$ by applying convolution theorem.	7	L3	4	1.1.4
c.	Solve by the method of Laplace transforms the equation	7	L3	5	1.1.5

	$y''' + 2y'' - y' - 2y = 0$ given $y(0) = y'(0) = 0$ and $y''(0) = 6$				

Syllabus for B.E IV - Semester for academic year 2022 – 2023

(For students admitted to I year in 2021-22, CS, IS, AIML and EC)

21UMA401C	**Statistics and Probability Distributions**	**03 - Credits (3 : 0 : 0)**
Hours / Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I **10 Hrs.**

Statistics:

Curve fitting by the method of least squares: $y = a + bx$, $y = ab^x$, $y = a + bx + cx^2$. Correlation, expression for the rank correlation coefficient and regression.

UNIT – II **10 Hrs.**

Probability: addition rule, conditional probability, multiplication rule, Baye's rule. Discrete and continuous random variables-Probability density function, Cumulative distribution function, Problems on expectation and variance.

UNIT – III **10 Hrs.**

Probability distributions:

Binomial distributions, Poisson distributions and Normal distributions. Concept of joint probability, Joint probability distributions.

UNIT – IV **10 Hrs.**

Markov chains: \

Introduction, Probability vectors, Stochastic Matrices, Fixed Points and Regular stochastic Matrices, Markov chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states.

References:

1. Numerical Methods for Engineers by Steven C Chapra & Raymond P Canale.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
3. Advanced Engineering Mathematics By H. K. Das, S. Chand & company Ltd. Ram Nagar, New Delhi
4. Advanced Engineering Mathematics by E Kreyszig ,John Wiley & Sons.
5. Probability and stochastic processes by Roy D. Yates and David J. Goodman, wiley India pvt.ltd 2nd edition 2012.
6. Theory and problems of probability by Seymour Lipschutz (Schaum's Series).

Course Objectives:

1. To apply the knowledge of Statistics in various Engineering fields
2. To be acquired knowledge about predictions preferably on the basis of mathematical equations
3. To be understand the principal concepts about probability

Syllabus for B.E IV - Semester for academic year 2022 – 2023

(For students admitted to I year in 2021-22, CS, IS, AIML and EC)

Course Outcomes:

After completion of the course the students shall be able to,

1. Apply the least square sense method to construct the specific relation for the given group of data.
2. Solve problems on correlation and regression
3. Apply the concepts of probability
4. Apply the concepts of probability distributions
5. Apply the concept of Markov Chain for commercial and industry purpose.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
No	**Programme Outcomes** **Course Outcomes**															
The students will be able to:																
1	Apply the least square sense method to construct the specific relation for the given group of data.	3	2													
2	Solve problems on correlation and regression	3	2													
3	Apply the concepts of probability	3	2													
4	Apply the concepts of probability distributions	3	2													
5	Apply the concept of Markov Chain for commercial and industry purpose.	3	2													

Competencies Addressed in the course and Corresponding Performance Indicators
Programme Outcome: Any of 1 to 12 PO's:

Competency	Indicators	
1.1 Apply the knowledge of Mathematics to the solution of Engineering problems	1.1.1	Apply the knowledge of least square sense method to solve Engineering Problems.
	1.1.2	Apply the knowledge of correlation and regression to solve problems.
	1.1.3	Apply the concepts probability, to solve Engineering Problems.
	1.1.4	Apply the basic concepts probability distributions, to solve problems.
	1.1.5	Apply the knowledge of Markov Chain to solve engineering problems.

Example: 1.2.3: Represents program outcome '1' , competency '2' , & performance indicator '3' .

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2	--	--	--	--	--	--	--	--	--	--
CO2	3	2	--	--	--	--	--	--	--	--	--	--
CO3	3	2	--	--	--	--	--	--	--	--	--	--
CO4	3	2	--	--	--	--	--	--	--	--	--	--
CO5	3	2	--	--	--	--	--	--	--	--	--	--

Evaluation Scheme:

Assessment	**Marks**	**Weightage**
CIE-I	40	20
CIE-II	40	20
Assignments/ Quizzes/Case Study/ Course Project/ Term Paper/Field Work	10	10
SEE	100	50
Total	**190**	**100**

Question paper pattern for CIE-I and CIE-II:

Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering Unit-I and Unit-II (no multiple choice questions and No true or false questions).

1. In Part-B, four questions are to be set as per the following table.

CIE	Number of questions / Maximum marks	Sub divisions	Covering entire unit
I	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-I
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-II
II	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-III
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-IV

Question paper pattern for SEE:

Syllabus for B.E IV - Semester for academic year 2022 – 2023

(For students admitted to I year in 2021-22, CS, IS, AIML and EC)

1. Question paper consists Part-A and Part-B. Question number 1 is compulsory, it consists of short answer questions of 1 or 2 marks, covering entire syllabus (no multiple choice questions and No true or false questions, 50% of questions must be L3 and L4 level).
2. In Part-B total of eight questions with two from each unit; with internal choice to be set uniformly covering the entire syllabus.
3. Each question carries 20 marks and should not have more than four subdivisions.
4. In Part-B, any FOUR full questions are to be answered choosing at least one from each unit.
5. Sketches, figures and tables if any should be clearly drawn, as the same is scanned for printing.
6. The question paper should contain all the data / figures / marks allocated, with clarity.

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT

DEPARTMENT OF MATHEMATICS

FIRST CIE

Course	**:B.E**	**Semester**	**:IV**
Subject	**: Statistics and Probability Distributions**	**Branch**	**:Common**
Subject Code	**:UMA491C**	**Max. Marks**	**: 40**
Duration	: **1**$\frac{1}{2}$ hours		

Q. No.	**Question**	**MARKS**	**BL**	**CO**	**PI**
	PART-A Compulsory. Answer all questions.				
1. a	Write normal equations to fit y = mx + c by least square method	2	L2	1	1.1.1
b	Write normal equations to fit $y = ab^x$ by least square method	2	L1	1	1.1.1

<table>
<tr><td>c</td><td>Define probability</td><td>2</td><td>L3</td><td>2</td><td>1.1.2</td></tr>
<tr><td>d</td><td>A variable X has the probability distribution
<table>
<tr><td>x</td><td>-3</td><td>6</td><td>9</td></tr>
<tr><td>P(x)</td><td>1/6</td><td>1/2</td><td>1/3</td></tr>
</table>
find E(X)</td><td>2</td><td>L2</td><td>2</td><td>1.1.3</td></tr>
<tr><td>e</td><td>Define probability density function</td><td>2</td><td>L1</td><td>1</td><td>1.1.3</td></tr>
<tr><td></td><td>PART – B
Answer any Two Full questions</td><td></td><td></td><td></td><td></td></tr>
</table>

<table>
<tr><td>2 a)</td><td>Fit a straight for the following data
<table>
<tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>y</td><td>2</td><td>5</td><td>3</td><td>8</td><td>7</td></tr>
</table></td><td>5</td><td>L3</td><td>3</td><td>1.1.1</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>b)</td><td>Fit a parabola of second degree $y = a + bx + cx^2$ for the data
<table>
<tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>y</td><td>10</td><td>12</td><td>13</td><td>16</td><td>19</td></tr>
</table></td><td>5</td><td>L3</td><td>3</td><td>1.1.1</td></tr>
<tr><td>c)</td><td>Fit a curve $y = ab^x$ for the data
<table>
<tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>y</td><td>87</td><td>97</td><td>113</td><td>129</td><td>202</td><td>195</td><td>193</td></tr>
</table></td><td>5</td><td>L3</td><td>4</td><td>1.1.1</td></tr>
</table>

<table>
<tr><td>3 a)</td><td>Find the correlation coefficient and the equation of the lines of regression for the following
<table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>y</td><td>2</td><td>5</td><td>3</td><td>8</td><td>7</td></tr></table></td><td>5</td><td>L3</td><td>3</td><td>1.1.1</td></tr>
<tr><td>b)</td><td>The scores for nine students in physics and math are as follows:
● Physics: 35, 23, 47, 17, 10, 43, 9, 6, 28
● Mathematics: 30, 33, 45, 23, 8, 49, 12, 4, 31
Compute the student’s ranks in the two subjects and compute the Spearman rank correlation.</td><td>5</td><td>L3</td><td>6</td><td>1.1.1</td></tr>
<tr><td>c)</td><td>Show that if θ is the angle between the lines of regression, then
$tan\theta = \frac{\sigma_x\sigma_y}{\sigma_x^2+\sigma_y^2}\left(\frac{1-r^2}{r}\right)$.</td><td>5</td><td>L3</td><td>6</td><td>1.1.1</td></tr>
<tr><td>4a)</td><td>Prove that $P(A\cup B)=P(A)+P(B)-P(A\cap B)$</td><td>5</td><td>L3</td><td>2</td><td>1.1.1</td></tr>
<tr><td>b)</td><td>A Shooter can hit a target in 3 out of 4 shorts and another shooter can hit the target in 2 out of 2 out of 3 shots. Find the probability that the target is being hit (a) when both of them try (b) by only one shooter.</td><td>5</td><td>L3</td><td>2</td><td>1.1.1</td></tr>
<tr><td>c)</td><td>State and prove Baye’s theorem</td><td>5</td><td>L3</td><td>2</td><td>1.1.1</td></tr>
<tr><td>5a)</td><td>The probability distribution of a random variable X is given by the following table
<table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>P(x)</td><td>0.1</td><td>k</td><td>0.2</td><td>2k</td><td>0.3</td><td>k</td></tr></table>
Find K, mean and variance</td><td>5</td><td>L3</td><td>2</td><td>1.1.2</td></tr>
<tr><td>b)</td><td>Imagine you are a financial analyst at an investment bank. According to your research of publicly-traded companies, 60% of the companies that increased their share price by more than 5% in the last three years replaced their CEOs during the period.
At the same time, only 35% of the companies that did not increase their share price by more than 5% in the same period replaced their CEOs. Knowing that the probability that the stock prices grow by more than 5% is 4%, find the</td><td>5</td><td>L3</td><td>2</td><td>1.1.2</td></tr>
</table>

	probability that the shares of a company that fires its CEO will increase by more than 5%. (Example on Bays theorem)				
c)	Assume two independent events, A and B. Let P(A) = 0.6 and P(B) = 0.4. Then find P(A ∪ B) .	5	L3	2	1.1.2

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT
DEPARTMENT OF MATHEMATICS
Second CIE

Course	**:B.E**		**Semester**
Subject	**: Statistics and Probability Distributions**		**Branch**
Subject Code	**:UMA491C**		**Ma:**

Syllabus for B.E IV - Semester for academic year 2022 – 2023

(For students admitted to I year in 2021-22, CS, IS, AIML and EC)

		x. Marks	40	
Duration	**: 1$\frac{1}{2}$ hours**			
Q. No.	**Question**	**MARKS**	**BLL**	**CO**
	PART-A Compulsory. Answer all questions.			
a	Define binomial distribution	**2**	L2	4
b	Define Poisson distributions	**2**	L1	4
c	Define Normal distributions	**2**	L3	4
d	What is **Markov chain**	**2**	L2	5
e	Define Stochastic Matrix and Regular Stochastic Matrix	**2**	L3	5
	PART – B **Answer any Two Full questions**			
2a	Find mean and variance for binomial distribution	**5**	L2	4
b	2% of the fuses manufactured by a firm are found to be defective. Find the probability that a box containing 200 fuses contains i) no defective fuses ii) 3 or more defective fuses	**5**	L2	4
c	In a normal distribution. 31% of the items are under 45 and 8% are over 64. Find the mean and S. D.	**5**	L3	4
3a	The joint probability distribution of two random variables X and Y is given below	**5**	L2	4

Y X	-3	2	4
1	0.1	0.2	0.2
3	0.3	0.1	0.1

<table>
<tr><td></td><td>Find i) marginal distribution of X and Y ii) covariance of X and Y</td><td></td><td></td><td></td></tr>
<tr><td>b</td><td>.The joint probability distribution of two random variables X and Y is given below
<table>
<tr><td>y
x</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>1</td><td>0.06</td><td>0.15</td><td>0.09</td></tr>
<tr><td>2</td><td>0.14</td><td>0.35</td><td>0.21</td></tr>
</table>
Find i) marginal distribution of X and Y ii) covariance of X and Y</td><td>5</td><td>L3</td><td>4</td></tr>
<tr><td>c</td><td>If X and Y are random variables having joint density function
$$f(x,y)=\begin{cases}4xy; \ 0\le x\le 1, \ 0\le y\le 1\\ 0 \quad\quad\quad otherwise\end{cases}$$
Verify that i)E(X + Y) = E(X) + E(Y) ii) E(XY) = E(X)E(Y)</td><td>5</td><td>L3</td><td>4</td></tr>
<tr><td>4a</td><td>Explain i) Stochastic Matrix ii) Transient State iii) Absorbing State of a Markov chain</td><td>5</td><td>L2</td><td>5</td></tr>
<tr><td>b</td><td>The t.p.m P of a Markov chain is given by $\begin{bmatrix}1/2 & 1/2\\ 3/4 & 1/4\end{bmatrix}$ with the initial probability distribution (1/4, 3/4). define $P_{21}^{(2)}, \ P_{12}^{(2)}, \ P^2, \ P_1^{(2)}$</td><td>5</td><td>L2</td><td>5</td></tr>
<tr><td>c</td><td>A students study habits are as follows. If he studies one night, he is 70% sure not to study the next night. On the other hand if he does not study one night he is 60% sure to study the next night. In the long run how often does he study?</td><td>5</td><td>L3</td><td>5</td></tr>
</table>

5a	Find a unique fixed probability vector for the regular stochastic matrix. $\begin{bmatrix} 0 & 3/4 & 1/4 \\ 1/2 & 1/2 & 0 \\ 0 & 1 & 0 \end{bmatrix}$	**5**	L3	5
b	Show that $P = \left[0\ 1\ 0\ 0\ 0\ 1\ \frac{1}{2}\ \frac{1}{2}\ 0\right]$is a regular stochastic matrix	**5**	L3	5
c	Prove that the Markov chain whose transition probability matrix is $P = \left[0\ \frac{2}{3}\ \frac{1}{3}\ \frac{1}{2}\ 0\ \frac{1}{2}\ \frac{1}{2}\ \frac{1}{2}\ 0\right]$is irreducible. Find the corresponding stationary probability vector	**5**	L3	5

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT
DEPARTMENT OF MATHEMATICS

Model Question Paper

Subject	:Statistics and Probability Theory	Semester	: IV
Subject Code	:UMA491C	Branch	: (EC/EEE/EI/CSc/ISC,AI)
Duration	:3 Hours	Max. Marks	: 100

Q. No.	**Question**	**MARKS**	**BL**	**CO**	**PI**
	PART-A Compulsory. **Answer all questions.**				
i	Fit a curve P = mW + c for the following data <table><tr><td>x</td><td>5</td><td>10</td><td>15</td></tr><tr><td>P(x)</td><td>16</td><td>19</td><td>23</td></tr></table>	2	L2	1	1.1.1
ii	Write normal equations to fit $y = ab^x$ by least square method	2	L1	1	1.1.1
iii	The probability that A passes a test is 2/3 and the probability that B passes a test is 3/5. Find the probability that only one will pass the test?	2	L3	2	1.1.2

<table>
<tr><td>iv</td><td>A variable X has the probability distribution. Find mean and variance
<table><tr><td>x</td><td>10</td><td>20</td><td>30</td><td>40</td></tr><tr><td>P(x)</td><td>1/8</td><td>3/8</td><td>3/8</td><td>1/8</td></tr></table></td><td>2</td><td>L2</td><td>2</td><td>1.1.3</td></tr>
<tr><td>v</td><td>The joint density function of two continuous random variables X and Y is
$$f(x,y)=\begin{cases} x^2+xy/3; & 0<x<1,\ 0<y<2 \\ 0 & otherwise \end{cases}$$
f(x, y) find a) P(X > 1/2)</td><td>2</td><td>L1</td><td>1</td><td>1.1.3</td></tr>
<tr><td>vi</td><td>Determine the binomial distribution for mean 4 variance 2. Also find p(X < 3)</td><td>2</td><td>L2</td><td>4</td><td>1.1.4</td></tr>
<tr><td>vii</td><td>If a random variable has a Passion distribution P(1) = P(2), find mean</td><td>2</td><td>L1</td><td>4</td><td>1.1.4</td></tr>
<tr><td>viii</td><td>If z is normal distribution with mean 0 and variance 1 find p(z < 1.64)</td><td>2</td><td>L3</td><td>4</td><td>1.1.4</td></tr>
<tr><td>ix</td><td>Define Stochastic Matrix and Regular Stochastic Matrix</td><td>2</td><td>L2</td><td>5</td><td>1.1.5</td></tr>
<tr><td>x</td><td>Three students A, B, C are throwing ball to each other. A always throws the ball to B and B always throws the ball to C. C is just as likely to throw the ball to B as to A. Find t. p. m.of the Markov chain</td><td>2</td><td>L2</td><td>5</td><td>1.1.5</td></tr>
</table>

Part B

<table>
<tr><td></td><td>NOTE: Answer any fourQuestions choosing at least ONE full question from each unit.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Q.No.</td><td>QUESTION</td><td>MARKS</td><td>BLL</td><td>CO</td><td>PI</td></tr>
<tr><td></td><td>UNIT-I</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2. a.</td><td>Find the equation of the best fitting straight line y=a+bx for the data
<table><tr><td>x</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td></tr><tr><td>y</td><td>16</td><td>19</td><td>23</td><td>26</td><td>30</td></tr></table></td><td>6</td><td>L3</td><td>1</td><td>1.1.1</td></tr>
<tr><td>b.</td><td>Fit a parabola $y = a + bx + cx^2$ in the least square sense for the data
<table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr><tr><td>y</td><td>2</td><td>6</td><td>7</td><td>8</td><td>10</td><td>11</td><td>11</td><td>10</td><td>9</td></tr></table></td><td>7</td><td>L3</td><td>1</td><td>1.1.1</td></tr>
</table>

<table>
<tr><td>c.</td><td>Fit a curve of the form $y = ab^x$ for the data
<table><tr><td>x</td><td>0</td><td>2</td><td>4</td><td>5</td><td>7</td><td>10</td></tr><tr><td>y</td><td>100</td><td>120</td><td>256</td><td>390</td><td>710</td><td>1600</td></tr></table></td><td>7</td><td>L3</td><td>1</td><td>1.1.1</td></tr>
<tr><td>3. a.</td><td>Show that if 'θ'is the angle between the lines of regression ,then
$$\tan\theta = \frac{\sigma_x\sigma_y}{\sigma_x^2+\sigma_y^2}\left(\frac{1-r^2}{r}\right)$$</td><td>6</td><td>L2</td><td>2</td><td>1.1.2</td></tr>
<tr><td>b.</td><td>Obtain the lines of regression and hence find the coefficient of correlation for the following data
<table><tr><td>x</td><td>1</td><td>3</td><td>4</td><td>2</td><td>5</td><td>8</td><td>9</td><td>10</td><td>13</td><td>15</td></tr><tr><td>y</td><td>8</td><td>6</td><td>10</td><td>8</td><td>12</td><td>16</td><td>16</td><td>10</td><td>32</td><td>32</td></tr></table></td><td>7</td><td>L3</td><td>2</td><td>1.1.2</td></tr>
<tr><td>c.</td><td>Compute the rank correlation coefficient for the following data
<table><tr><td>x</td><td>68</td><td>64</td><td>75</td><td>50</td><td>64</td><td>80</td><td>75</td><td>40</td><td>55</td><td>64</td></tr><tr><td>y</td><td>62</td><td>58</td><td>68</td><td>45</td><td>81</td><td>60</td><td>68</td><td>48</td><td>50</td><td>70</td></tr></table></td><td>7</td><td>L3</td><td>2</td><td>1.1.2</td></tr>
<tr><td></td><td>UNIT-II</td><td></td><td></td><td></td><td></td></tr>
<tr><td>4. a.</td><td>If A and B are two events of S which are mutually exclusive then $P(A\cup B) = P(A) + P(B) - P(A\cap B)$</td><td>6</td><td>L2</td><td>3</td><td>1.1.3</td></tr>
<tr><td>b.</td><td>Given $P(A) = 3/4, P(B) = 1/5$ and $P(A\cap B) = 1/20$, find $P(A\cup B)$, $P(A\cap\overline{B}), P(\overline{A}\cap B)$, $P\left(\frac{A}{B}\right), P\left(\frac{B}{A}\right), P\left(\frac{\overline{A}}{\overline{B}}\right)$.</td><td>7</td><td>L3</td><td>3</td><td>1.1.3</td></tr>
<tr><td>c.</td><td>An office has 4 secretaries handling respectively 20%, 60%, 15% and 5% of the files of all government reports. The probability that they misfile such reports are respectively 0.05, 0.1, 0.1 and 0.05. Find the probability that the misfiled report can be blamed on the first secretary.</td><td>7</td><td>L3</td><td>3</td><td>1.1.3</td></tr>
<tr><td>5. a.</td><td>Show that the following distribution represents a discrete probability distribution. Find mean and variance.
<table><tr><td>x</td><td>10</td><td>20</td><td>30</td><td>40</td></tr><tr><td>p(x)</td><td>1/8</td><td>3/8</td><td>3/8</td><td>1/8</td></tr></table></td><td>6</td><td>L2</td><td>3</td><td>1.1.3</td></tr>
</table>

<table>
<tr><td>b.</td><td>A random variable has the following probability density function
<table><tr><td>x</td><td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>p(x)</td><td>k</td><td>2k</td><td>3k</td><td>4k</td><td>3k</td><td>2k</td><td>k</td></tr></table>Find i) k ii) p(x≤1) iii) p (x>1) iv) p (-1<x≤2)</td><td>7</td><td>L2</td><td>3</td><td>1.1.3</td></tr>
<tr><td>c.</td><td>Find the constant k such that $f(x) = \{kx^2 , 0 < x < 3\ 0\ otherwise$
Also compute
$P(1 < x < 2)\ ii) P(x \leq 1)\ iii)\ P(x > 1)\ iv)\ Mean\ v)\ Variance$</td><td>7</td><td>L2</td><td>3</td><td>1.1.3</td></tr>
<tr><td></td><td>UNIT-III</td><td></td><td></td><td></td><td></td></tr>
<tr><td>6. a.</td><td>Find the Binomial probability distribution which has mean 2 and variance 4/3.</td><td>6</td><td>L3</td><td>4</td><td>1.1.4</td></tr>
<tr><td>b.</td><td>Find the mean and standard deviation of the Poisson distribution.</td><td>7</td><td>L3</td><td>4</td><td>1.1.4</td></tr>
<tr><td>c.</td><td>If x is a normal variate with mean 30 and standard deviation 5 find the probability that i) 26≤x≤40 ii) x≥45</td><td>7</td><td>L3</td><td>4</td><td>1.1.4</td></tr>
<tr><td>7. a.</td><td>The joint probability distribution of two random variables X and Y is as follows
<table><tr><td>Y
X</td><td>-4</td><td>2</td><td>7</td></tr><tr><td>1</td><td>1/8</td><td>1/4</td><td>1/8</td></tr><tr><td>5</td><td>1/4</td><td>1/8</td><td>1/8</td></tr></table>Compute E(X), E(Y), E (XY) and COV(X, Y).</td><td>6</td><td>L3</td><td>4</td><td>1.1.4</td></tr>
<tr><td>b.</td><td>The joint probability distribution of two random variables X and Y is given by
$f(x, y) = k(2x + y)$where x and y are integers such that $0 \leq x \leq 2$, $0 \leq y \leq 3$. a) Find k b) Find the marginal distributions of X and Y. c) Show that
X and Y are dependent</td><td>7</td><td>L3</td><td>4</td><td>1.1.4</td></tr>
<tr><td>c.</td><td>Find the value of the constant c such that
$f(x) = \{c(2x + y), 0 \leq x \leq 2, 0 \leq y \leq 3\ 0\ \ \ otherwise$
is a joint probability density function of X and Y. Hence evaluate $P(X \geq 1, Y \leq 2)$.</td><td>7</td><td>L3</td><td>4</td><td>1.1.4</td></tr>
<tr><td></td><td>UNIT-IV</td><td></td><td></td><td></td><td></td></tr>
<tr><td>8. a.</td><td>Define i) Probability vector ii) Stochastic matrix iii) Regular stochastic matrix.</td><td>6</td><td>L2</td><td>5</td><td>1.1.5</td></tr>
<tr><td>b.</td><td>Find the unique fixed probability vector for the regular stochastic matrix
$\left[0\ 1\ 0\ \frac{1}{6}\ \frac{1}{2}\ \frac{1}{3}\ 0\ \frac{2}{3}\ \frac{1}{3}\right]$</td><td>7</td><td>L3</td><td>5</td><td>1.1.5</td></tr>
</table>

c.	Show that $P = \left[0\ 1\ 0\ 0\ 0\ 1\ \frac{1}{2}\ \frac{1}{2}\ 0\right]$is a regular stochastic matrix.	7	L3	5	1.1.5
9 .a.	Define absorbing state of Markov chain. Find the absorbing state of the following $\left[\frac{1}{2}\ 0\ \frac{1}{2}\ 0\ 1\ 0\ 0\ \frac{1}{4}\ \frac{3}{4}\right]$	6	L2	5	1.1.5
b.	Prove that the Markov chain whose transition probability matrix is $P = \left[0\ \frac{2}{3}\ \frac{1}{3}\ \frac{1}{2}\ 0\ \frac{1}{2}\ \frac{1}{2}\ \frac{1}{2}\ 0\right]$is irreducible. Find the corresponding stationary probability vector.	7	L3	5	1.1.5
c.	A students study habits are as follows. If he studies one night, he is 70% sure not to study the next night. On the other hand if he does not study one night, he is 60% not to study the next night. In the long run how often does he study?	7	L3	5	1.1.5

Syllabus for B.E IV - Semester for academic year 2022 – 2023

(For students admitted to I year in 2021-22, CV, ME, IP)

21UMA402C	**Partial differential equations and Statistics**	**03 - Credits (3 : 0 : 0)**
Hours / Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	**10 Hrs.**
Partial Differential Equations(PDE): Introduction to PDE: Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Solution of Lagrange's linear PDE, method of separation of variables, Derivation of one dimensional heat and wave equations and solutions by the method of separation of variables.	
UNIT – II	**10 Hrs.**
Statistics and Probability Curve fitting by the method of least squares: $y = a + bx$, $y = ab^x$ and $y = a + bx + cx^2$ Correlation and regression. **Probability**: addition rule, conditional probability, multiplication rule, Baye's rule.	
UNIT – III	**10 Hrs.**
Probability distributions: Random variables, Problems on expectation and variance. Binomial distributions Poisson distributions and Normal distributions.	
UNIT – IV	**10 Hrs.**
Joint Probability distributions: Concept of joint probability, Joint distributions - discrete random variables. **Markov chains:** Introduction, Probability vectors, Stochastic Matrices, Fixed Points and Regular stochastic Matrices, Markov chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states.	

References:

1. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
2. Advanced Engineering Mathematics By H. K. Das, S. Chand & company Ltd. Ram Nagar, New Delhi
3. Advanced Engineering Mathematics by E Kreyszig ,John Wiley & Sons.
4. Probability and stochastic processes by Roy D. Yates and David J. Goodman, wiley India pvt.ltd 2nd edition 2012.
5. Theory and problems of probability by Seymour Lipschutz (Schaum's Series).

Syllabus for B.E IV - Semester for academic year 2022 – 2023

(For students admitted to I year in 2021-22, CV, ME, IP)

Learning Objectives:

1. To introduce the basic concepts required to understand, construct, solve and interpret Partial differential equations.
2. To acquire knowledge about predictions preferably on the basis of mathematical equations.
3. To understand the principal concepts about probability.

Course Outcomes:

After completion of the course the students shall be able to,

1. Understand a variety of partial differential equations and solve by exact methods.
2. Derive heat and wave equations and solve by the method of separation of variables.
3. Understand the concepts of curve fitting and probability.
4. Apply the concepts of probability distributions.
5. Apply the concept of Markov Chain for commercial and industry purpose.

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
No	**Programme Outcomes** **Course Outcomes**															
The students will be able to:																
1	Understand a variety of partial differential equations and solve by exact methods.	3	2													
2	Derive heat and wave equations and solve by the method of separation of variables.	3	2													
3	Understand the concepts of curve fitting and probability.	3	2													
4	Apply the concepts of probability distributions	3	2													
5	Apply the concept of Markov Chain for commercial and industry purpose.	3	2													

Syllabus for B.E IV - Semester for academic year 2022 – 2023

(For students admitted to I year in 2021-22, CV, ME, IP)

Competencies Addressed in the course and Corresponding Performance Indicators

Programme Outcome: Any of 1 to 12 PO's:

Competency	Indicators	
1.1 Apply the knowledge of Mathematics to the solution of Engineering problems	1.1.1	Apply the knowledge of partial differential equations to solve Engineering Problems.
	1.1.2	Apply the knowledge of heat and wave equations to solve problems.
	1.1.3	Apply the concepts of curve fitting and probability, to solve Engineering Problems.
	1.1.4	Apply the basic concepts of probability distributions, to solve problems.
	1.1.5	Apply the knowledge of Markov Chain to solve engineering problems.

Example: 1.2.3: Represents program outcome '1' , competency '2' , & performance indicator '3' .

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes	Programme Outcomes											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	3	2	--	--	--	--	--	--	--	--	--	--
CO2	3	2	--	--	--	--	--	--	--	--	--	--
CO3	3	2	--	--	--	--	--	--	--	--	--	--
CO4	3	2	--	--	--	--	--	--	--	--	--	--

CO5	3	2	--	--	--	--	--	--	--	--	--	--

Evaluation Scheme:

Assessment	Marks	Weightage
CIE-I	40	20
CIE-II	40	20
Assignments/ Quizzes/Case Study/ Course Project/Term Paper/Field Work	10	10
SEE	100	50
Total	**190**	**100**

Question paper pattern for CIE-I and CIE-II:

Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering Unit-I and Unit-II (no multiple choice questions and No true or false questions).

1. In Part-B, four questions are to be set as per the following table.

CIE	Number of questions / Maximum marks	Sub divisions	Covering entire unit
I	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-I
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-II
II	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-III
	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-IV

Question paper pattern for SEE:

1. Question paper consists Part-A and Part-B. Question number 1 is compulsory, it consists of short answer questions of 1 or 2 marks, covering entire syllabus (no multiple choice questions and No true or false questions, 50% of questions must be L3 and L4 level).
2. In Part-B total of eight questions with two from each unit; with internal choice to be set uniformly covering the entire syllabus.
3. Each question carries 20 marks and should not have more than four subdivisions.
4. In Part-B, any FOUR full questions are to be answered choosing at least one from each unit.
5. Sketches, figures and tables if any should be clearly drawn, as the same is scanned for printing.
6. The question paper should contain all the data / figures / marks allocated, with clarity.

Syllabus for B.E IV - Semester for the academic year 2022 – 2023

(For students admitted to I year in 2021-22, **EEE**)

21UMA403C	**Computation Techniques for Electrical Systems -II**	**03 - Credits (3 : 0 : 0)**
Hours / Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	**10 Hrs.**
Fourier analysis of Discrete Time Periodic and Aperiodic signals: Introduction, Properties of Discrete - time Fourier series , Linearity, Time shift, Frequency shift, Scaling, Differentiation and Integration, Convolution and Modulation, Parseval's theorem and problems on Fourier series and Fourier transforms.	
UNIT – II	**10 Hrs.**
Numerical Analysis - I Introduction to root finding problems, Newton-Raphson method. Finite differences, forward and backward difference operators (no derivations on relations between operators) Newton-Gregory forward and backward interpolation formulae. (Without proof), Lagrange's Method (without proof). Numerical differentiation using Newton's forward and backward formulae-problems. Numerical Integration: Trapezoidal rule, Simpson's one third rule.	
UNIT – III	**10 Hrs.**
Numerical Analysis - II : Numerical methods for solution of differential equations:Euler's and Modified Euler's method, Runge-Kutta 4th order method.Step by step method(point by point method)**Statistics:** Curve fitting by the method of least squares: $y = a + bx$, $y = a + bx + cx^2$, $y = ab^x$.	
UNIT – IV	**10 Hrs.**
Basic Probability Theory: Probability concepts, Random variables probability distributions. Binomial distributions, Poisson distributions and Normal distributions. Concept of joint probability, Joint probability distributions.	

References:

1. Numerical Methods for Engineers by Steven C Chapra & Raymond P Canale.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
3. Advanced Engineering Mathematics By H. K. Das, S. Chand & company Ltd. Ram Nagar, New Delhi
4. "Signals and Systems"by Ganesh Rao, Satish Tunga, Sanguine Technical Publishers, 2nd Edition, 2020.
5. Signals and Systems, Uday Kumar S.PRISM book publisher, 6th Edition, 2013
6. H P HSU, "Signals and Systems," Schaums Outline, TMH, 2nd Edition, 2011.
7. Probability and stochastic processes by Roy D. Yates and David J. Goodman, wiley India pvt.ltd 2nd edition 2012.
8. Theory and problems of probability by Seymour Lipschutz (Schaum's Series).

Syllabus for B.E IV - Semester for the academic year 2022 – 2023

(For students admitted to I year in 2021-22, EEE)

Learning Objectives:

1. To understand concepts of Fourier series, Fourier transforms.
2. To understand the numerical methods for solving algebraic & transcendental equations
3. To understand the numerical methods for solving ordinary differential equations.
4. To acquire the knowledge of interpolation techniques
5. To understand the basic concepts of numerical differentiation, numerical integration and numerical solutions of ordinary differential equations.
6. To understand the principal concepts about probability theory.
7. To apply the knowledge of Statistics and probability in Electrical and Electronics Engineering fields

Course Outcomes:

After completion of the course the students shall be able to,

1. Apply the concepts of Fourier series and Fourier transforms to analyse Discrete Time Periodic and aperiodic signals.
2. Solve engineering problems using numerical techniques.
3. Obtain the numerical solution of ordinary differential equations.
4. Apply the concepts of Statistics and probability to solve problems in Engineering.

Syllabus for B.E IV - Semester for the academic year 2022 – 2023

(For students admitted to I year in 2021-22, EEE)

Course Articulation Matrix: Mapping of Course Outcomes (CO) with Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
No	**Programme Outcomes** **Course Outcomes**															
The students will be able to:																
1	Apply the concepts of Fourier series and Fourier transforms to analyse Discrete Time Periodic and aperiodic signals.	3	2										2			
2	Solve engineering problems using numerical techniques.	3	2													
3	Obtain the numerical solution of ordinary differential equations.	3	2													
4	Apply the concepts of Statistics and probability to solve problems in Engineering.	3	2													

Competencies Addressed in the course and Corresponding Performance Indicators

Programme Outcome: Any of 1 to 12 PO's:

Competency	Indicators
1.1 Apply the knowledge of Mathematics to the solution of Engineering problems	1.1.1 Apply the concepts of Fourier series and Fourier transforms to analyse Discrete Time Periodic and a periodic signals.
	1.1.2 Solve engineering problems using numerical techniques.
	1.1.3 Obtain the numerical solution of ordinary differential equations.

	1.1.4 Apply the concepts of Statistics and probability to solve problems in Engineering.

Example: 1.2.3: Represents program outcome ‘1’ , competency ‘2’ , & performance indicator ‘3’ .

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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Course Outcomes	**Programme Outcomes**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
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CO2	3	2	--	--	--	--	--	--	--	--	--	--
CO3	3	2	--	--	--	--	--	--	--	--	--	--
CO4	3	2	---	--	--	--	--	--	--	--	--	--

Evaluation Scheme:

Assessment	**Marks**	**Weightage**
CIE-I	40	20
CIE-II	40	20
Assignments/ Quizzes/Case Study/ Course Project/Term Paper/Field Work	10	10
SEE	100	50
Total	**190**	**100**

Question paper pattern for CIE-I and CIE-II:

Syllabus for B.E IV - Semester for the academic year 2022 – 2023

(For students admitted to I year in 2021-22, EEE)

Question paper consists Part-A and Part-B. Part A is compulsory, it consists of short answer questions of 1 or 2 marks, covering Unit-I and Unit-II (no multiple choice questions and No true or false questions).

1. In Part-B, four questions are to be set as per the following table.

CIE	Number of questions / Maximum marks	Sub divisions	Covering entire unit
I	Two questions of 15 marks (Solve any one)	Sub divisions shall not be mixed within the unit	Unit-I
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Question paper pattern for SEE:

1. Question paper consists Part-A and Part-B. Question number 1 is compulsory, it consists of short answer questions of 1 or 2 marks, covering entire syllabus (no multiple choice questions and No true or false questions, 50% of questions must be L3 and L4 level).
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4. In Part-B, any FOUR full questions are to be answered choosing at least one from each unit.
5. Sketches, figures and tables if any should be clearly drawn, as the same is scanned for printing.
6. The question paper should contain all the data / figures / marks allocated, with clarity.