JSPM'S
JSPM NARHE TECHNICAL CAMPUS
Department of Engineering Science
(2024-25)

Department: Mechanical Engineering **Course: FE**

Course Title: Engineering Graphics

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**Explain** the fundamentals of Engineering Graphics and basic principles of geometric construction and apply the knowledge of Projections, Methods to prepare the drawings for points and lines.
CO2	**Apply** the types of Projections, Methods to prepare the drawings for planes.
CO3	**Construct** the various engineering curves and illustrate the application of various engineering curves and draw the development of the lateral surface of solid.
CO4	**Apply** the concept of orthographic projection of an object to draw several 2D views for visualizing the physical state of the object.
CO5	**Apply** the visualization skill to draw an isometric projection from given orthographic views.

Establish the correlation between the Courses and the Program Outcomes (POs) and Program Specific Outcomes (PSOs)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
CO1	1	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"
CO2	"-"	"-"	2	"-"	"-"	3	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"
CO3	2	"-"	"-"	"-"	3	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"
CO4	"-"	"-"	"-"	"-"	3	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"
CO5	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	1	"-"	"-"	"-"	"-"	"-"
CO6	3	"-"	"-"	"-"	"-"	"-"	"-"	"-"	"-"	2	"-"	"-"	"-"	"-"	"-"

Note:
Enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High), *It there is no correlation, put "-"*
Justification for mapping CO to corresponding PO

Course Outcome (CO)	Mapped PO	Level of mapping	Justification
CO 1	PO 1	1	For identifying different mechanical elements and to explain forces acting them knowledge of science and engineering fundamentals are slightly used.
CO 2	PO 3, PO 6	2, 3	Knowledge of science and engineering fundamentals are slightly used to understand fundamentals of design.
CO 3	PO 5	3	To categorize and to identify different manufacturing processes for various engineering applications knowledge of engineering fundamentals is slightly utilized
CO 4	PO 5	3	For selecting machine tools for manufacturing machine components, fundamental of engineering is slightly used.
CO 5	PO 10	1	For pressure temperature measurement devices and for calculating heat engine efficiency, basic concepts of thermodynamics are slightly utilized.

Date:
Signature: Faculty HOD

Marks allocations as per the course objectives in university examinations.

JSPM'S
JSPM NARHE TECHNICAL CAMPUS
Department of Engineering Science
(2024-25)

COURSE OUTCOME	MARKS ALLOCATION	RELATED SLLABUS UNITS
CO1	14	I
CO2	14	II
CO3	14	II
CO4	14	IV
CO5	14	V

Date:
Signature: Faculty HOD

JSPM'S
JSPM NARHE TECHNICAL CAMPUS
Department of Engineering Science
(2024-25)

Department: Engineering **Course: FE**

Course Title: Engineering Mathematics-I
Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	Apply mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems. Determine the Fourier series representation and harmonic analysis of periodic functions in engineering applications.
CO2	Evaluate derivative functions of several variables that are essential in various engineering problems.
CO3	Apply the concept of Jacobian to find partial derivatives of implicit function and functional dependence. Use of partial derivatives in estimating errors & approximations and finding extreme values of the function.
CO4	Apply the essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, Linear dependence & Independence, finding linear and orthogonal transformations.
CO5	Determine Eigen values & Eigen vectors. Use it to diagonalize matrix and to reduce quadratic form to canonical form, applicable to engineering problems.

Establish the correlation between the Courses and the Program Outcomes (POs) and Program Specific Outcomes (PSOs)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	"-"	"-"	"-"	"-"	1	"-"	"-"	"-"	"-"	"-"	1
CO2	2	"-"	"-"	"-"	"-"	**1**	"-"	"-"	"-"	"-"	"-"	**1**
CO3	2	"-"	"-"	"-"	"-"	1	"-"	"-"	"-"	"-"	"-"	1
CO4	2	"-"	"-"	"-"	"-"	1	"-"	"-"	"-"	"-"	"-"	1
CO5	2	"-"	"-"	"-"	"-"	1	"-"	"-"	"-"	"-"	"-"	1

Note:
Enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High), *It there is no correlation, put "-"*
Justification for mapping CO to corresponding PO

Course Outcome (CO)	Mapped PO	Level of mapping	Justification
CO 1	PO1, PO6, PO12	2,1,1	Apply the knowledge Mean Value Theorems, Moderately use the concept of Taylor's , Maclaurian, Fourier series expansion of differentiable functions and evaluate the limit of indeterminate forms using L'Hospital Rule to the solution of engineering problems.
CO 2	PO1, PO6, PO12	2,1,1	Apply the knowledge of Partial and Total derivative of functions of several variables to the solution of engineering problems.
CO 3	PO1, PO6, PO12	2,1,1	Apply the knowledge of Partial of Jacobian to find partial derivatives of implicit function and functional dependence. Use of partial derivatives in estimating errors & approximations and finding extreme values of the function.

CO 4	PO1, PO6, PO12	2,1,1	Knowledge of matrices and mathematics fundamentals moderately to the solution of system of linear equations, orthogonally of linear transformation
CO 5	PO1, PO6, PO12	2,1,1	Knowledge of matrices and Eigen values, Eigen vectors, essential in various engineering problems.

Date:
Signature: Faculty HOD

Marks allocations as per the course objectives in university examinations.

COURSE OUTCOME	MARKS ALLOCATION	RELATED SLLABUS UNITS
CO1	14	I
CO2	14	II
CO3	14	II
CO4	14	IV
CO5	14	V

Date:
Signature: Faculty HOD

JSPM's Narhe Technical Campus
Department of First Year Engineering

Subject: Basic Electronics Engineering

Course Outcomes (CO):

Course objectives(CO)	Statement
CO1	Know about the working of P-N junction diode and its applications as rectifier and switch, basics of LED and photodiode.
CO2	Understand the working BJT and MOSFET ,their characteristics and compare.
CO3	Learn logic gates and realization of the digital circuits.
CO4	Understand the functioning of OPAMP and electronic instruments.
CO5	Select sensors based on their working principle for specific applications and its implementation with communication system.

Establish the correlation between the Courses and the Program Outcomes (POs) and Program Specific Outcomes (PSOs)

C0	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2	3											2
CO3	3	1										2
CO4	2				1							
CO5	2	1										2

Note:
Enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High),*It there is no correlation, put "-"*

JSPM'S
JSPM NARHE TECHNICAL CAMPUS
Department of Engineering Science
(2024-25)

Course Title: Engineering Physics

Course Outcomes (CO):

Course Outcomes:
After successful completion of the course, learner will be able to:

CO1: Develop the understanding of working principle of lasers, optical fibers and extend it to holography and fiber optic communication.

CO2: Deduce Schrödinger's wave equations and apply it to problems on the bound states by summarizing fundamentals of quantum physics.

CO3: Explain phenomena of interference in thin films, polarization, double refraction and connect to the Anti-Reflection Coating, LCD.

CO4: Develop understanding of Fermi level and Fermi energy in semiconductors on the basis of results of Fermi Dirac statistics and relate them with the working of Semiconducting devices. Extend the understanding of Ultrasonic to thickness measurement, flaw detection.

CO5: Explain properties of nanoparticles and estimate engineering applications; Explain phenomenon of Superconductivity and estimate engineering applications

Programme Outcomes (PO's) :-

1. **Engineering knowledge:**

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

2. **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.

3. **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.

4. **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.

5. **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.

6. **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.

7. **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.

8. **Ethics:**

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

9. **Individual and team work:**

   Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **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.

11. **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.

12. **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

JSPM'S
JSPM NARHE TECHNICAL CAMPUS
Department of Engineering Science
(2024-25)
Department of First Year Engineering

Basic Electrical Engineering

Course outcomes(CO):

Course outcomes(CO):	Statement
CO1	Apply Kirchhoff's Laws, Superposition theorem and network simplification techniques for DC circuit analysis.
CO2	Analyze the magnetic circuit parameters, self-Inductance, mutual Inductance and Electromotive Forces (EMF's).
CO3	Calculate AC quantities using mathematical equations, waveforms and phasor diagrams.
CO4	Compute the voltage, current and power of the given 1-phase and 3-phase AC circuits
CO5	Understand the working principle of 1-Phase Transformer, Motors (DC, Induction) and their practical applications.

Program Outcomes (POs)

Program Outcomes (POs): - Engineering Graduates will be able to:

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

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

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

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

10. 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.

11. 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.

12. **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.

JSPM'S
JSPM NARHE TECHNICAL CAMPUS
Department of Engineering Science
(2024-25)
CO and PO statement

COURSE NAME: Engineering Mechanics

Course outcomes statements

On completion of the course learner will be able to–

CO1: Determine resultant of various force systems

CO2: Determine centroid, moment of inertia and solve problems related to friction

CO3:Determine reactions of beams, calculate forces in cables using principles of equilibrium

CO4: Solve trusses, frames for finding member forces and apply principles of equilibrium to forces in space

CO5: Calculate position, velocity and acceleration of particle using principles of kinematics

CO6: Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy

Program outcome statements

Program Outcomes: - (POs)

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

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

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

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

10. 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.

11. 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.

12. 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

Engineering Chemistry

CO1: Understand the practical approaches and techniques required to effectively monitor water quality. CO2: Select appropriate electro analytical techniques for understanding the materials.

CO3: Demonstrate the structure and properties of advanced engineering materials for various technological applications.

CO4: Analyze different types of conventional and alternative fuels.

CO5: Explain causes of corrosion and methods for minimizing corrosion.

JSPM'S
JSPM NARHE TECHNICAL CAMPUS
Department of Engineering Science
(2024-25)

Subject: Engineering Mathematics - II

VISION

To satisfy the aspirations of youth force, who want to lead the nation towards prosperity.

MISSION

To provide, nurture and maintain an environment of high academic excellence, research and entrepreneurship for all the aspiring students, which will prepare them to face global challenges maintaining high ethical and moral standards through quality practices.

OBJECTIVE

To familiarize the students with Advanced techniques of integration, Tracing of curve, Solid geometry, Multiple integrals and their applications, Mathematical modeling of physical systems using differential equations. The aim is to equip them with the concept and tools to understand advanced level mathematics and its applications, that would enhance thinking power, useful in their disciplines.

COURSE OUTCOMES:

After successful completion of the course, learner will be able to:

CO1: Apply advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions useful in evaluating multiple integrals and their applications.

CO2: Trace the curve for a given equation and measure arc length of various curves. Apply the concepts of solid geometry to solve problems on sphere, cone and cylinder in a comprehensive manner.

CO3: Evaluate multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.

CO4: Apply the effective mathematical tools for solving first order ordinary differential equations such as Exact and Reducible to exact Linear and reducible to Linear.

CO5: Model physical systems using ordinary differential equations, solve and analyze the solutions apply to Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc.

PROGRAM OUTCOME:

PO1 Apply the knowledge of mathematics, science, engineering fundamentals, and Civil Engineering principles to the solution of complex problems in Civil Engineering.

PO2 Identify, formulate, research literature, and analyze complex Civil Engineering problems
reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3 Design solutions for complex Civil 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 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 related to Civil Engineering problems.

PO5 Create, select, and apply appropriate techniques, resources, and modern engineering tools
such as CAD, FEM and GIS including prediction and modeling to complex Civil Engineering activities with an understanding of the limitations.

PO6 Apply reasoning informed by the contextual knowledge to assess societal, health, safety,
legal and cultural issues and the consequent responsibilities relevant to the professional Civil Engineering practice.

PO7 Understand the impact of the professional Civil Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 Apply ethical principles and commit to professional ethics and responsibilities and norms of
the Civil Engineering practice.

PO9 Function effectively as an individual, and as a member or leader in diverse teams, and in
multidisciplinary settings

PO10 Communicate effectively on complex Civil 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 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 Civil

Engineering projects and in multidisciplinary environments.

PO12 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 Objectives:

To make the students familiarize with Mathematical Modeling of physical systems using differential equations advanced techniques of integration, tracing of curve, multiple integrals and their applications. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance thinking power, useful in their disciplines.

COURSE OUTCOMES:

After successful completion of the course, learner will be able to:

CO1: Apply advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions useful in evaluating multiple integrals and their applications.

CO2: Trace the curve for a given equation and measure arc length of various curves. Apply the concepts of solid geometry to solve problems on sphere, cone and cylinder in a comprehensive manner.

CO3: Evaluate multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.

CO4: Apply the effective mathematical tools for solving first order ordinary differential equations such as Exact and Reducible to exact Linear and reducible to Linear.

CO5: Model physical systems using ordinary differential equations, solve and analyze the solutions apply to Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc.

TLO

UNIT I: INTEGRAL CALCULUS

TLO1. Evaluate integrals by using Reduction Formulae

TLO2. Beta and Gamma functions which are commonly used in double integrals, Fourier transforms,

Laplace transforms.

TLO3. Understand the Leibnitz's Rule of DUIS and Error Function.

UNIT II: CURVE TRACING AND SOLID GEOMETRY

TLO4. Understand the concept of curve tracing and draw approximate shape of the curve.

TLO5. Find the length of an arc of a curve.

TLO6. Understand the basic concept of Geometric Coordinate Systems.

TLO7. Understand the concept of Sphere use concept of locus, touching sphere, section of sphere etc.

TLO8. Understand the concept of right circular cone and Right circular cylinder.

TLO9. Use the concept of right circular cone and Right circular cylinder to solve examples

UNIT III: - MULTIPLE INTEGRALS AND APPLICATIONS

TLO10. Understand the concept of multiple integral.

TLO11. Evaluate Multiple Integral.

TLO12. Use the concept of Multiple Integral to find Area, Volume, Moment of Inertia and Root Mean Square Values.

UNIT IV:- FIRST ORDER ORDINARY DIFFERENTIAL

TLO13. Suggest the proper method to find the solution of given differential equation homogeneous function ,Exact Differential Equation

TLO14. Understand the general form of homogeneous function ,Exact, Linear differential equation.

UNIT V: APPLICATIONS OF DIFFERENTIAL EQUATIONS

TLO15. Understand the Physical, chemical, mechanical systems etc.

TLO16. Form the DE from real world problem.

TLO to CO Mapping with the help of Articulation Matrix: -

	CO: 1	CO: 2	CO: 3	CO: 4	CO: 5
TLO: 1	✓				
TLO: 2	✓				
TLO: 3	✓				
TLO: 4		✓			
TLO: 5		✓			
TLO: 6		✓			
TLO: 7		✓			
TLO: 8		✓			
TLO: 9		✓			
TLO: 10			✓		
TLO: 11			✓		
TLO: 12			✓		
TLO: 13				✓	
TLO: 14				✓	

TLO: 15					✓
TLO: 16					✓

CO To PO Mapping with Articulation Matrix:

	PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	1	-	-	-	-	-	1
CO2	2	-	-	-	-	1	-	-	-	-	-	1
CO3	2	-	-	-	-	1	-	-	-	-	-	1
CO4	2	-	-	-	-	1	-	-	-	-	-	1
CO5	2	-	-	-	-	1	-	-	-	-	-	1

Direct Assessment Tools for CO Attainment

Course Outcome	Assessment tool	% total	Result
CO1	UT, IE, A, PE, UE	A	
CO2	UT, IE, A, PE, UE	B	
CO3	A, PE, UE	C	
CO4	A, PE, UE	D	
CO5	A, PE, UE	E	

Subject Incharge
FE Coordinator

JSPM'S
JSPM NARHE TECHNICAL CAMPUS
Department of Engineering Science
(2024-25)

Subject: Programming and Problem Solving

VISION

To satisfy the aspirations of youth force, who want to lead the nation towards prosperity.

Mission

To provide, nurture and maintain an environment of high academic excellence, research and entrepreneurship for all the aspiring students, which will prepare them to face global challenges maintaining high ethical and moral standards through quality practices.

Objective

To familiarize the students with advanced techniques of integration, Tracing of curve, Solid geometry, Multiple integrals and their applications, Mathematical modeling of physical systems using differential equations. The aim is to equip them with the concept and tools to understand advanced level mathematics and its applications, that would enhance thinking power, useful in their disciplines.

Course OUTCOMEs:

After successful completion of the course, learner will be able to:

CO1: Inculcate and apply various skills in problem solving
CO2: Choose appropriate programming constructs and features to solve the problems in diversified domains.
CO3: Exhibit the programming skills for the problem-solving using functions and string manipulations..

CO4: Demonstrate File handling and dictionaries in Python.
CO5: Apply Object Oriented concepts in Python.

Program Outcome:

PO1 Apply the knowledge of mathematics, science, engineering fundamentals, and Civil Engineering principles to the solution of complex problems in Civil Engineering.

PO2 Identify, formulate, research literature, and analyze complex Civil Engineering problems
reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3 Design solutions for complex Civil 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 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 related to Civil Engineering problems.

PO5 Create, select, and apply appropriate techniques, resources, and modern engineering tools
such as CAD, FEM and GIS including prediction and modeling to complex Civil Engineering activities with an understanding of the limitations.

PO6 Apply reasoning informed by the contextual knowledge to assess societal, health, safety,
legal and cultural issues and the consequent responsibilities relevant to the professional Civil Engineering practice.

PO7 Understand the impact of the professional Civil Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 Apply ethical principles and commit to professional ethics and responsibilities and norms of
the Civil Engineering practice.

PO9 Function effectively as an individual, and as a member or leader in diverse teams, and in
multidisciplinary settings

PO10 Communicate effectively on complex Civil 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 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 Civil Engineering projects and in multidisciplinary environments.

PO12 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.

JSPM'S
JSPM NARHE TECHNICAL CAMPUS
Department of Engineering Science
(2024-25)

Subject: BXE

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 practices.
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 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 Skills**	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 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.