Marathwada Shikshan Prasarak Mandal's
DEOGIRI INSTITUTE OF ENGINEERING AND MANAGEMENT STUDIES
(An Autonomous Institute)
Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad | B.Tech. | M.Tech.
Affiliated to Dr. Babasaheb Ambedkar Marathwada University, CSN | MBA
Approved by AICTE/UGC-Govt. of India & DTE-Govt. of Maharashtra
Deogiri College Campus, Railway Station Road, Chhatrapati Sambhajinagar- 431 005 (M.S.)
DTE CODE : 2114 0240-2367567, 2367577 www.dietms.org director@dietms.org

Department of Civil Engineering
MTech STRUCTURAL ENGINEERING PROGRAM STRUCTURE
(2025-27 Pattern)

Course Category			I	II	III	IV	Total Credits
Program Courses	Program Core Course (PCC)	-	12	04	04		24
		MOOC		04			
	Program Elective Course (PEC)		06	06			12
Vocational and Skill Education Courses (VSE)	Seminar		01				02
	PG Lab		01				
Humanities, Social Science and Management (HSSM)	Indian Knowledge System (IKS)			02			02
Experiential Learning Courses (EL)	Research Methodology			03			34
	Mini Project			01			
	Project				10	20	
Open Elective Courses (OE)	Open Elective (OE)				03		03
Multi-Disciplinary Minor Courses (MDM)	Multi-Disciplinary Minor (MDM)				03		03
Liberal Learning Courses (LLC)	Co-Curricular Courses (CC)					AU	Audit
Total Credits			**20**	**20**	**20**	**20**	**80**

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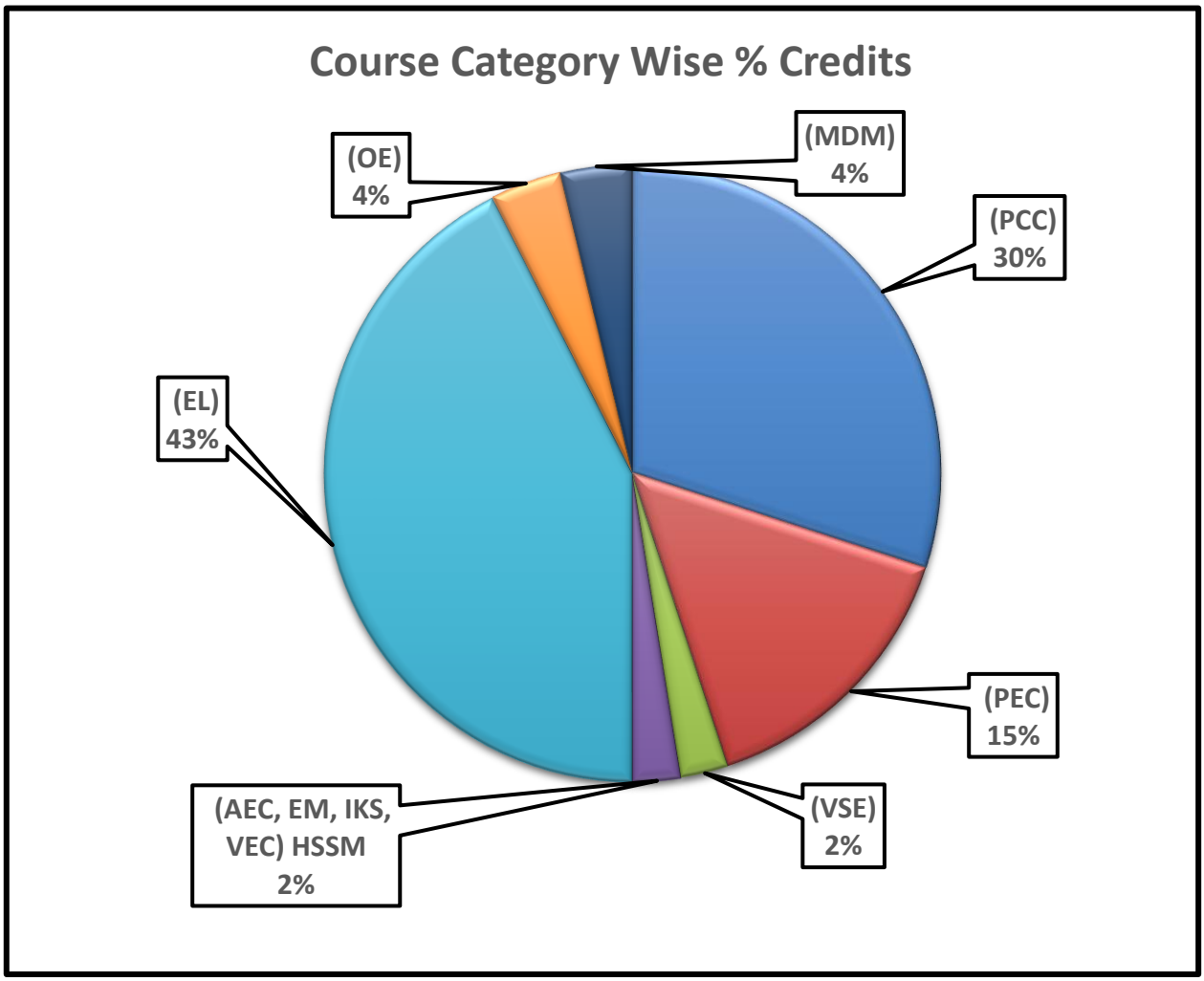
MTech in STRUCTURAL ENGINEERING		
Course Category	**Credits**	**% Credits**
Program Core Courses **(PCC)**	24	30
Program Elective Courses **(PEC)**	12	15
Vocational & Skill Enhancement **(VSE)**	02	02
Humanity, Social Science & Management (AEC, EM, IKS, VEC) **HSSM**	02	02
Experiential Learning **(EL)**	34	43
Open Electives **(OE)**	03	04
Multi-Disciplinary Minor (MDM)	03	04
Total Credits	**80**	**100 %**



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SEMESTER III												
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**					**Credits**
			L	**T**	**PR**	**Total**	**CA-I**	**CA-II**	**MSE**	**ESE**	**Total**	
PCC	PS253006	Finite Element Method	4	--	--	4	10	10	20	60	100	4
OE	PS2533--	Open Elective	3	--	--	3	10	10	20	60	100	3
MDM	PS2532--	Multi-Disciplinary Minor	3	--	--	3	10	10	20	60	100	3
EL	PS253603	Project I			10	10	25	25		50	100	10
Total			**10**	**0**	**10**	**20**	**55**	**55**	**60**	**230**	**400**	**20**

SEMESTER IV												
Category	**Course Code**	**Name of the Course**	**Teaching Scheme**				**Evaluation Scheme**					**Credits**
			L	**T**	**PR**	**Total**	**CA-I**	**CA-II**	**MSE**	**ESE**	**Total**	
EL	PS254604	Project II			20	20	50	50		100	200	20
CC	PG254701	Communication Skills and Technical Writing	2			2	25	25			50	AU
Total			**2**	**0**	**20**	**22**	**75**	**75**	**0**	**100**	**250**	**20**

Open Electives (OE)

Semester	Course Category	No. of Credits	Course Code	Course
SEM III	Open Elective	3	PS253311	Soil Dynamics & Machine Foundations
			PS253312	Solution Procedures in Civil Engineering
			PS253313	Advance Concrete Technology

Multi-Disciplinary Minor (MDM)

Semester	Course Category	No. of Credits	Course Code	Course
SEM III	Multi-Disciplinary Minor	3	PS253201	Student Psychology
			PS253202	Sustainable Power Generation System
			PS253203	Intellectual Property & Rights

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Course Title: Finite Element Method **Course Code: PS253006**		**Course Category: PCC**
Teaching Scheme	**Examination Scheme**	
Lectures: 04 hrs/ week	CA-1	10 Marks
Tutorial: -----	CA-2	10 Marks
Credits: 04	MSE	20 Marks
Semester: S Y M.Tech. (Semester III)	ESE	60 Marks
Course Prerequisite: Knowledge of Engineering Mathematics (Differential Equations, Linear Algebra, Variational Calculus).Fundamentals of Mechanics of Solids, Structural Analysis, and Theory of Elasticity.		
Course Description: This course provides a comprehensive understanding of the Finite Element Method (FEM) and its application to structural engineering problems. It covers approximate methods, variational principles, 1-D, 2-D, and 3-D FEM formulations, direct approaches, isoparametric elements, numerical integration, and computer implementation. Applications using FEM software such as ANSYS are also introduced for both static and dynamic structural analysis.		
Course Objectives: To make the students aware and understand 1. To understand the fundamental principles of FEM and approximate solution methods. 2. To formulate and solve 1-D, 2-D, and 3-D structural problems using FEM. 3. To apply variational principles, weighted residual methods, and shape functions for FEM analysis. 4. To analyze stress, displacement, and boundary value problems using FEM formulations. 5. To gain exposure to computer implementation and commercial FEM software (ANSYS) for structural applications.		

Course Outcomes:		
COs	**After completion of the course students will be able to**	**Bloom's Level**
CO1	**Understand** the different energy methods in structural analysis and basic concepts of finite element method	Understand (Level 2)
CO2	**Understand** the different energy methods in structural analysis and basic concepts of finite element method	Understand (Level 2)
CO3	**Analyse** 1-D problems related to structural analysis like Bars, Trusses, Beams and Frames using finite element approach	Analyze (Level 4)
CO4	**Find** solution to problems using direct approach methods like Rayleigh – Ritz or Galerkin's Method	Apply (Level 3)
CO5	**Solve** 2-D problems using knowledge of theory of elasticity	Analyze (Level 4)
CO6	**Implement** the knowledge of numerical methods in FEM to	Evaluate

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	find the solution to the various problems in statics and dynamics	(Level 5)

CO-PO-PSO Mapping													
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	-	2	1	-	-	-	-	-	-	2	-	2
CO2	3	3	-	2	2	-	-	-	-	-	-	3	-	3
CO3	3	3	-	2	2	-	-	-	-	-	-	3	-	3
CO4	3	2	-	2	1	-	-	-	-	-	-	2	2	-
CO5	3	3	-	2	2	-	-	-	-	-	-	3	2	3
CO6	3	2	-	2	1	-	-	-	-	-	-	2	2	2

Assessment	
CA-1 (a) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
CA-2 (b) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
MSE (c) (20 Marks)	Subjective Test

Course Contents		
Unit 1	**Introduction to FEM & Approximate Methods** Introduction, Overview of Various Methods to Solve Integral & Differential Equations (Point Collocation Method, Method of Least Square, Weighted Residual Method, Galerkin's Method), Variational Calculus (Hamilton's Variational Principle, Minimum Potential Energy Principle, Euler Lagrange Equation), Partial FEM (Kentorvich Method/ Finite Strip Method/ Semi-Analytical Method), Local & Global Finite Element Methods (Rayleigh-Ritz Method), Stepwise Procedure in FEM	**7 Hrs**
Unit 2	**One Dimensional FE Analysis** Application of FEM to Solve various 1-D problems (Shape Functions for 1-D Elements, Properties of Shape Functions, Lagrange Interpolating Polynomials), C0 Continuity, 1-D FE Analysis (Discretization, Selection of Shape Function, Defining Gradients of Primary Unknowns & Constitutive Equations, Derivation of Element Equations, Assembly & Application of Boundary Conditions, Computation of Primary and Secondary Unknowns), Direct Approach for Assembly, Boundary Conditions (Geometric, Natural), Concept of Sub-Structuring (Static Condensation), Stiffness Matrix for Basic Bar & Beam Element, Representation of Distributed Loading, The Assembly Process within the PMPE Approach, Element Stresses), FE Analysis of 1-D Non-Prismatic Members, Solution of Differential Equation using FEM, Solution of BIVP using Galerkin's	**6 Hrs**

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	MWR (1-D Transient Analysis).	
Unit 3	**FE Analysis by Direct Approach** C1 Continuity, Formulation of 1-D Beam Element, Classical Beam Theory, Element Equation Formulation (Galerkin's Approach, Rayleigh-Ritz approach), Derivation of Scalar Functional from Differential Equation and Vice Versa, Application to Fixed and Continuous Beams.	**7 Hrs**
Unit 4	**Two Dimensional FE Analysis** Conditions of Symmetry & Anti Symmetry (Applications), 2-D FE Analysis, Review of Theory of Elasticity, CST Element (3- Node Triangular Element), Pascal's Triangle and Pyramid, Area Co-ordinate, Stepwise Formulation, Equivalent Load Vector, Plane Stress Problems using CST Elements, 2-D Stress Analysis using 4-noded Rectangular Element, Stepwise Formulation, Effect of Aspect Ratio, Explicit & Implicit Isoparametric Formulation, Iso-parametric Elements for Plane Problems (Quadrilateral Element, Bilinear Element, Para-linear Element, Bi-Quadrilateral Element, Serendipity Elements, Lagrange Element), Numerical Integration, (1-D Domain, 2-D Domain, n-point Gauss Rule), Formulation of Transition Element	**6 Hrs**
Unit 5	**Three Dimensional FE Analysis & Computer Implementation of FEM** 3-D Stress Analysis using FEM, Iso-parametric Formulation, 3-D Brick Element, Application to 3-D Analysis, FEA of Axi- symmetric Solids Subjected to Axi-symmetric and Asymmetric Loads (Application of Partial FEM).	**6 Hrs**
Unit 6	**Computer Implementation of FEM** Computer Implementation of FEM, Application of FEM to Time Dependent Problems, Partial FEM h-version of FEM, p-version of FEM, Adaptive Meshing, Exposure to Hybrid FEM (Mixed/ Hybrid Formulation, Unidirectional Composites), Introduction to ANSYS, Static & Dynamic Analysis of 1-D, 2-D and 3-D structures using ANSYS	**6 Hrs**

Sr.No.	Text Books
1	O. C. Zienkiewicz & R. L. Taylor, The Finite Element Method Vol. I & II, Tata McGraw Hill
2	J. N. Reddy, An introduction to the Finite Element Method, Tata McGraw Hill Pub.
3	R. D. Cook, Concept and Application of Finite Element Analysis, John Wiley & sons
4	Hutton D.V., Fundamentals of Finite Element Analysis, Tata McGraw Hill Pub

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Sr.No.	Reference Books
1	C. S. Desai & J. F. Abel, Introduction to the Finite Element Method, CBS Pub.
2	C. S. Krishnamoorthy, Programming in the Finite Element Method, Tata McGraw Hill
3	Bathe K.J., Finite Element Procedures, PHI learning Pvt. Ltd
4	Y. M. Desai, T.I Eldho, Finite Element Method with application in Engineering, Pearson, Delhi

Sr.No.	Web Resources
1	NPTEL – Finite Element Analysis (IITs & IISc) https://nptel.ac.in
2	MIT OpenCourseWare – Finite Element Procedures https://ocw.mit.edu
3	Coursera – Introduction to Finite Element Analysis https://www.coursera.org

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Course Title: Soil Dynamics & Machine Foundations **Course Code: PS253311**		**Course Category: OE**
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	CA-1	10 Marks
Tutorial: -----	CA-2	10 Marks
Credits: 03	MSE	20 Marks
Semester: S Y M. Tech. (Semester III)	ESE	60 Marks

Course Prerequisite: Basic knowledge of soil mechanics, Dynamic properties of soil, such as dynamic shear modulus and elastic modulus, Vibration theory (including free and forced vibrations, and damping)

Course Description: A course on Soil Dynamics and Machine Foundations explores how soils behave under dynamic loads, such as those from earthquakes and machinery, and teaches students how to design foundations for such conditions. Key topics include the principles of vibration, wave propagation, dynamic properties of soil, liquefaction potential, and the design of machine foundations for different types of machines. The course is suitable for undergraduate, postgraduate, and research students in civil and geotechnical engineering, as well as practicing engineers

Course Objectives:

To make the students aware and understand

1. To introduce the fundamental concepts of wave propagation in soil media and enable students to understand how soil responds to dynamic disturbances.
2. To develop the ability to apply vibration theory for solving real-world dynamic soil problems and determining essential dynamic properties of soils.
3. To equip students with analytical skills to evaluate the behavior of machine foundations resting on both surface and embedded conditions under dynamic loading.
4. To provide in-depth understanding of block foundation behavior and enable analysis of different modes of vibration affecting soil–foundation interaction.
5. To familiarize students with design principles and IS Code provisions for foundations subjected to dynamic loads from reciprocating and impact machines.

Course Outcomes:		
COs	**After completion of the course students will be able to**	**Bloom's Level**
CO1	**Remember** the fundamentals of wave propagation in soil media.	Remember (Level 1)
CO2	**Understand** the principles of design of foundations for reciprocating and impact machines as per IS Code	Understand (Level 2)
CO3	**Apply** theory of vibrations to solve dynamic soil problems & to calculate the dynamic properties of soil	Apply (Level 3)
CO4	**Analyze** the behaviour a machine foundation resting on the	Analyze

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	surface and embedded foundation.	(Level 4)
CO5	**Analyze** the block foundation under different modes of vibrations.	Analyze (Level 4)

CO-PO-PSO Mapping													
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO3**
CO1	3	1	-	1	1	-	-	-	-	-	-	3	-	1
CO2	2	2	-	2	2	-	-	-	-	-	-	3	-	2
CO3	2	2	3	1	1	1	-	-	-	-	-	3	1	2
CO4	2	2	3	1	1	1	-	-	-	-	-	3	-	2
CO5	2	1	3	-	1	1	-	-	-	-	-	2	1	1

Assessment	
CA-1 (a) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
CA-2 (b) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
MSE (c) (20 Marks)	Subjective Test

Course Contents		
Unit 1	**Theory of Vibrations** Basic Definitions- Free and Forced Vibrations with and without Damping for Single Degree Freedom Systems- Resonance and its Effect, Magnification, Logarithmic Decrement, Transmissibility, Natural Frequency of Foundation – Soil system, Barkan's and IS methods, pressure bulb concept, Pauw's Analogy	**6 Hrs**
Unit 2	**Wave Propagation** Elastic Waves in Rods, Waves in Elastic Half Space, Dynamic Soil Properties, Field and Laboratory Methods of Determination – Up hole, Down Hole and Cross Hole Methods, Cyclic Plate Load Test, Block Vibration Test, Determination of Damping Factor	**6 Hrs**
Unit 3	**Machine Foundations** Machine Foundations: Types, Design criteria, permissible amplitudes and bearing pressure	**6 Hrs**
Unit 4	**Block Foundation** Block foundation: Degrees of freedom - analysis under different modes of vibration.	**6 Hrs**
Unit 5	**Two DoF Systems** Analysis of Two Degree freedom systems under free and forced vibrations -Principles of Design of Foundations for reciprocating and impact machines as per IS code	**6 Hrs**
Unit 6	**Vibration Isolation**	**6 Hrs**

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	Vibration Isolation: Types and methods, Isolating materials and their properties.	

Sr.No.	Text Books
1	P.Srinivasulu, G.V.Vaidyanathan, Handbook of Machine Foundations, Tata McGraw Hill.
2	Barken, Dynamics of Bases and Foundations, McGraw Hill Publishing Co., New York
3	Richart, Hall and Woods, Vibration of Soils and Foundations, Prentice Hall, Eaglewood Cliffs, New Jersy, USA.

Sr.No.	Reference Books
1	Swami Saran, Soil Dynamic and Machine Foundation, Second edition, Galgotia Publication, 2009.
2	N. S. V. Kameswara Rao, Vibration Analysis and Foundation Dynamics, Meeler Pub.,1998.
3	Samsher Prakash and V. K. Puri, Foundation for Machines: Analysis and Design, John Wiley & Sons., 1998.
4	Soil Dynamics, Samasher Prakash, MGH, 1981.

Sr.No.	Web Resources
1	Soil Dynamics, NPTEL- https://nptel.ac.in/courses/105101005
2	Soil Dynamic, NPTEL- https://nptel.ac.in/courses/105105221

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Course Title: Solution Procedure in Civil Engineering **Course Code: PS253312** **Course Category: OE**		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	CA-1	10 Marks
Tutorial: -----	CA-2	10 Marks
Credits: 03	MSE	20 Marks
Semester: S Y M.Tech. (Semester III)	ESE	60 Marks

Course Prerequisite: Basic knowledge of engineering mechanics and structural analysis, including concepts of equilibrium, stability, and strength of materials, Familiarity with matrix algebra, differential equations, and numerical methods for solving engineering problems, Prior exposure to basic concepts of finite element methods (FEM) and computational tools used in engineering analysis, Understanding of fundamental computer operations and programming concepts, preferably in Fortran, C, C++, or MATLAB.

Course Description: This course covers classical, numerical, computational, and experimental methods for advanced structural analysis. It includes classical stability and equilibrium approaches, numerical computations, finite element analysis, and experimental stress analysis techniques. Emphasis is placed on computer implementation of algorithms and use of modern software tools to analyze linear, nonlinear, and dynamic structural problems.

Course Objectives:

To make the students aware and understand

1. Understand classical analysis procedures and modeling assumptions.
2. Use advanced computational tools for linear and nonlinear analysis.
3. Apply numerical methods for solving structural engineering problems.
4. Implement finite element analysis (FEM) for stress and structural evaluation.
5. Analyse nonlinear and dynamic structural behavior using FEM.
6. Conduct experimental stress analysis and structural modelling.

Course Outcomes:		
COs	**After completion of the course students will be able to**	**Bloom's Level**
CO1	**Explain** classical structural analysis procedures and modelling assumptions.	Understand (Level 2)
CO2	**Compare** and utilize computational tools for linear and nonlinear analysis.	Apply (Level 3)
CO3	**Apply** numerical methods to solve structural engineering problems.	Apply (Level 3)
CO4	**Implement** finite element analysis (FEM) for structural discretization and stress evaluation.	Apply (Level 3)
CO5	**Analyze** geometrically and materially nonlinear problems and perform dynamic analysis.	Analyze (Level 4)

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CO6	**Conduct** experimental stress analysis and structural modeling using computer-based algorithms.	Apply (Level 4)

CO-PO-PSO Mapping													
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	1	–	1	–	–	–	–	–	–	1	-	-
CO2	3	3	2	–	3	–	–	–	–	–	–	1	3	-
CO3	3	3	3	–	3	–	–	–	–	–	–	1	-	-
CO4	3	3	3	–	3	–	–	–	–	–	–	1	2	2
CO5	3	3	3	–	3	–	–	–	–	–	–	1	-	-
CO6	3	3	3	3	3	–	–	–	–	–	–	1	-	3

Assessment	
CA-1 (a) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
CA-2 (b) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
MSE (c) (20 Marks)	Subjective Test

Course Contents		
Unit 1	**Classical Analysis Procedures** Basics of equilibrium and stability, Basic assumptions of Analysis, Concepts of Modelling, Basis of Idealization, Limitations of hand computations	**6 Hrs**
Unit 2	**Advanced Computational Tools** Comparative study of various engineering software available, Limitations and strengths, Linear, Nonlinear analysis provisions, Data Processing using Spreadsheet Applications, Statistical Computational Tools, Interpretation of results.	**6 Hrs**
Unit 3	**Numerical Computations** Basis of Computations, Operations on Computers, Solution of Simultaneous Equations, Methods for Roots of Equations, Solution of Ordinary Differential Equations, Numerical Integration.	**6 Hrs**
Unit 4	**Finite Element Analysis** Discretization, Implementation of FEM -Calculation of Element Stiffness, Mass and Equivalent Nodal Loads, Assemblage of Structures Matrices, Boundary Conditions, Solutions of the overall problem, Calculations of Element Stresses, Computer Program Organization	**6 Hrs**
Unit 5	**Introduction to Non Linear Analysis by FEM,** Formulation of a Geometrically Non-linear Problem, Non-linear material behaviour, General Formulation of a Physically Nonlinear	**6 Hrs**

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	Problem**.** **Introduction to Dynamic Analysis by FEM**, Formulation of Dynamic Properties, Free Vibration, Steady-State and Transient Response Analysis for simple Problems	
Unit 6	**Experimental stress analysis** Model Analysis, Structural similitude, Use of models, Scale effect, Structural and Dimensional analysis, Buckingham Pi Theorem, Indirect model analysis, Use of Begg's and Eney's Deformeters, Moment indicators, Design of models for direct and indirect analysis, Structural modelling and testing. Computer Implementation of Solution Procedures Implementation of above methods by algorithm development leading to programming in Fortran / C / C++ / Matlab or any other suitable platform.	**6 Hrs**

Sr.No.	Text Books
1	Reddy, C. S. Basic Structural Analysis, Tata McGraw-Hill.
2	Wang, C. K. Statically Indeterminate Structures, McGraw-Hill.
3	Chapra, S. C. & Canale, R. P. Numerical Methods for Engineers, Tata McGraw-Hill.
4	Krishnamoorthy, C. S. Finite Element Analysis, Tata McGraw-Hill.

Sr.No.	Reference Books
1	Scheid, F. Numerical Analysis (Schaum's Outline Series), Tata McGraw-Hill.
2	Hetenyi, M. Handbook of Experimental Stress Analysis, John Wiley & Sons.
3	Sienkiewicz, O. C. Finite Element Method in Engineering Science, McGraw-Hill Book Co.
4	Cook, R. D., et al.Concepts and Applications of Finite Element Analysis, John Wiley & Sons (Asia) Pvt. Ltd.

Sr.No.	Web Resources
1	https://nptel.ac.in/
2	https://swayam.gov.in/

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Course Title: Advanced Concrete Technology **Course Code: PS253313**		**Course Category: OE**
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	CA-1	10 Marks
Tutorial: -----	CA-2	10 Marks
Credits: 03	MSE	20 Marks
Semester: S Y M.Tech. (Semester III)	ESE	60 Marks

Course Prerequisite: Basics of Materials Science and Construction Materials, Elementary knowledge of Cement–Concrete nomenclature and laboratory testing.

Course Description: This course covers the constituents, production and properties of concrete in fresh and hardened states, mix proportioning methods, admixtures and mineral additives, durability issues and deterioration mechanisms, non-destructive assessment techniques, and special concretes. Emphasis is on linking material behavior to practical mix design, quality control and long-term performance of concrete structures.

Course Objectives:

To make the students aware and understand

1. Provide thorough knowledge of ingredients of concrete (aggregates, cements, admixtures) and their influence on performance.
2. Explain fresh concrete behaviour (workability, mixing, placement, curing) and standard mix-proportioning approaches.
3. Teach mechanical and time-dependent properties of hardened concrete (strength, elasticity, creep, shrinkage).
4. Introduce durability concepts, common deterioration mechanisms (corrosion, ASR, sulphate attack, freeze–thaw) and mitigation strategies.
5. Provide thorough knowledge of Non-destructive test
6. Provide knowledge about special concrete and new techniques used in construction.

Course Outcomes:		
COs	**After completion of the course students will be able to**	**Bloom's Level**
CO1	**Understand** the testing of concrete materials as per IS code.	Understand (Level 2)
CO2	**Relating** Gain ideas on non-destructive testing of concrete	Understand (Level 2)
CO3	**Summarising** Gain ideas on special concrete and new techniques in construction	Understand (Level 2)
CO4	**Know** the procedure to determine the properties of fresh and hardened of concrete.	Understand (Level 2)
CO5	**Design** the concrete mix using ACI and IS code methods.	Apply (Level 3)
CO6	**Select** and Design special concretes depending on their specific applications.	Apply & Create

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		(Level 3 & 5)

CO-PO-PSO Mapping														
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO3**
CO1	3	2	1	-	1	2	2	2	-	2	-	2	3	-
CO2	3	3	2	-	1	1	2	2	-	2	-	2	3	2
CO3	3	3	3	3	2	1	2	2	-	2	2	3	3	2
CO4	3	3	3	2	2	1	3	2	-	2	2	3	3	2
CO5	3	2	2	3	2	1	2	2	-	2	-	2	2	3
CO6	3	2	2	2	2	2	1	2	-	2	-	2	3	3

Assessment	
CA-1 (a) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
CA-2 (b) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
MSE (c) (20 Marks)	Subjective Test

Course Contents		
Unit 1	**Ingredients of concrete** Aggregates: Review of types; sampling and testing; effects on properties of concrete, production of artificial aggregates. Cements: Review of types of cements, chemical composition; properties and tests, chemical and physical process of hydration, Blended cements.	**6 Hrs**
Unit 2	**Properties of fresh concrete** Basics regarding fresh concrete – mixing, workability, placement, consolidation, and curing, segregation and bleeding Chemical Admixtures: types and classification; actions and interactions; usage; effects on properties of concrete. Mineral Admixtures: Fly ash, ground granulated blast furnace slag, met kaolin, rice- husk ash and silica fume; chemical composition; physical characteristics; effects on properties of concrete; advantages and disadvantages. Proportioning of concrete mixtures: Factors considered in the design of mix BIS Method, ACI method.	**6 Hrs**
Unit 3	**Properties of hardened concrete** Strength- compressive tensile and flexure - Elastic properties - Modulus of elasticity - Creep-factors affecting creep, effect of creep - shrinkage- factors affecting shrinkage, plastic shrinkage, drying shrinkage, autogenous shrinkage, carbonation shrinkage.	**6 Hrs**
Unit 4	**Durability of concrete** Durability concept; factors affecting, reinforcement corrosion; fire	**6 Hrs**

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	resistance; frost damage; sulphate attack; alkali silica reaction; concrete in seawater, statistical quality control, acceptance criteria as per BIS code. Non-destructive testing of concrete: Surface Hardness, Ultrasonic, Penetration resistance, Pull- out test, chemical testing for chloride and carbonation- core cutting - measuring reinforcement cover	
Unit 5	**Special concretes** Lightweight concrete- description of various types -High strength concrete - Self compacting concrete -Roller compacted concrete – Ready mixed concrete – Fibre reinforced concrete - polymer concrete.	**6 Hrs**
Unit 6	**New Techniques in Constructions** Sprayed concrete; underwater concrete, mass concrete; 3d concrete printing, self-healing concrete.	**6 Hrs**

Sr.No.	Text Books
1	Neville A.M., "Properties of Concrete", Trans-Atlantic Publications, Inc.; 5e, 2012
2	Job Thomas., "Concrete Technology", Cenage learning
3	R. Santhakumar„ Concrete Technology", Oxford Universities Press, 2006
4	Shetty M. S., Concrete Technology", S. Chand & Co., 2006

Sr.No.	Reference Books
1	Mehta and Monteiro, „Concrete-Micro structure, Properties and Materials", McGraw Hill Professional
2	Neville A. M. and Brooks J. J., Concrete Technology, Pearson Education, 2010
3	Lea, Chemistry of Cement and Concrete", Butterworth-Heinemann Ltd, 5e, 2017
4	Bungey, Millard, Grantham – Testing of Concrete in Structures- Taylor and Francis, 2006

Sr.No.	Web Resources
1	https://nptel.ac.in/
2	https://swayam.gov.in/

Sr.No.	IS Codes
1	IS:10262(2009) CONCRETE MIX PROPORTIONING - GUIDELINES
2	IS:456 (2009), Plain and Reinforced Concrete
3	IS 4926: 2003 Code of Practice Ready-Mixed Concrete

Chairman, Board of Studies

Course Title: Student Psychology **Course Code: PS253201**		**Course Category: MDM**
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	CA-1	10 Marks
Tutorial: -----	CA-2	10 Marks
Credits: 03	MSE	20 Marks
Semester: S Y M.Tech. (Semester III)	ESE	60 Marks

Course Prerequisite: Basic understanding of the teaching–learning process and general classroom practices. Fundamental knowledge of human behavior gained through prior schooling or introductory education courses, Ability to read and interpret simple educational concepts, case studies, and examples, Interest in understanding learners, their developmental stages, and common classroom problems, Basic communication skills to participate in discussions, counseling activities, and practical exercises.

Course Description: This course provides a comprehensive understanding of learner behavior, development, and the psychological principles that support effective teaching. Through six structured modules, students explore the foundations of educational psychology, characteristics and problems of learners, the use of psychological tests, cognitive and developmental processes, and essential counseling skills. The course equips future educators, counselors, and professionals with the knowledge and tools needed to identify student needs, address behavioral and emotional challenges, and enhance the overall teaching–learning environment. Emphasis is placed on practical application, motivation strategies, and basic counseling methods, including an introduction to Neuro-Linguistic Programming (NLP).

Course Objectives:

To make the students aware and understand

1. Understand the basic principles of educational psychology.
2. Identify student characteristics and learning differences.
3. Recognize and address common student problems.
4. Use psychological tests and motivation techniques effectively.
5. Explain cognitive, emotional, and social development in learners.
6. Apply basic counselling skills and NLP strategies in educational settings.

Course Outcomes:		
COs	**After completion of the course students will be able to**	**Bloom's Level**
CO1	**Describe** key concepts of educational psychology and their role in teaching–learning.	Understand (Level 2)
CO2	**Identify** learner characteristics and factors affecting student behavior.	Understand (Level 2)
CO3	**Explain** stages of cognitive, emotional, and social development in learners.	Understand (Level 2)

Chairman, Board of Studies

CO4	**Apply** psychological tests and motivation strategies in educational settings.	Apply (Level 3)
CO5	**Demonstrate** basic counseling skills and use NLP techniques to support students.	Apply (Level 3)
CO6	**Analyze** common academic and behavioral problems among students.	Analyze (Level 4)

CO-PO-PSO Mapping														
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO3**
CO1	3	2	–	–	2	–	–	–	–	–	–	-	–	-
CO2	3	3	-	–	2	–	–	–	–	–	–	3	–	-
CO3	3	3	2	-	2	–	–	2	–	2	–	-	2	-
CO4	3	2	3	2	3	–	–	–	–	–	–	2	–	2
CO5	3	3	2	-	2	–	–	–	–	–	–	-	3	-
CO6	3	3	3	2	3	–	–	–	–	–	–	2	–	3

Assessment	
CA-1 (a) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
CA-2 (b) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
MSE (c) (20 Marks)	Subjective Test

Course Contents		
Unit 1	**Introduction to Educational Psychology:** Meaning, scope, and importance of educational psychology, Role of teachers and learners, Teaching–Learning process and influencing factors	**6 Hrs**
Unit 2	**Student Characteristics: -** Types of learners, Individual differences, Student behaviour patterns and learning styles	**6 Hrs**
Unit 3	**Student Problems:** Academic, emotional, behavioural, and social problems, Identification of student difficulties, Classroom management related to student issues	**6 Hrs**
Unit 4	**Psychological Tests & Motivation:** Types of psychological tests and inventories, Use of tests for assessment and guidance, Student motivation and motivational strategies	**6 Hrs**
Unit 5	**Cognitive & Developmental Psychology:** Physical and cognitive development, Emotional and social development, Impact of developmental stages on learning	**6 Hrs**
Unit 6	**Counseling Skills & NLP:** Basics of counselling and communication skills, Counselling techniques for student support, Introduction to Neuro-Linguistic Programming (NLP), Summary and integration of all modules	**6 Hrs**

Chairman, Board of Studies

Sr.No.	Text Books
1	Woolfolk, A. (2013). Educational Psychology. New Delhi: Pearson Education..
2	Mangal, S.K. (2012). Educational Psychology. Ludhiana: Prentice Hall India.
3	Passi, B.K. (2001). Advanced Educational Psychology. Delhi: Anmol Publications.

Sr.No.	Reference Books
1	Hurlock, E.B. (2001). Child Development. New Delhi: McGraw-Hill.
2	Bhatia, H.R. (2005). Psychology for Teachers. Delhi: Doaba House.
3	Nabhi, R.K. (2004). Counselling Skills and Techniques. Delhi: R.K. Publications.
4	O'Connor, J., & Seymour, J. (1990). Introduction to NLP. London: Thorsons.
5	Santrock, J.W. (2011). Developmental Psychology. New Delhi: Tata McGraw-Hill.
6	Sharma, R.A. (2007). Training Technology. Meerut: Surya Publications.
7	Mukhopadhyay, B. (1997). Motivation in Educational Management. New Delhi: Sterling Publishers.

Sr.No.	Web Resources
1	https://nptel.ac.in/
2	https://swayam.gov.in/

Chairman, Board of Studies

Course Title: Sustainable Power Generation System **Course Code: PS253202**		**Course Category: MDM**
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	CA-1	10 Marks
Tutorial: -----	CA-2	10 Marks
Credits: 03	MSE	20 Marks
Semester: S Y M.Tech. (Semester III)	ESE	60 Marks

Course Prerequisite: Thermodynamics and Heat Transfer, Basic Electrical Engineering Concepts, Basic knowledge of environmental science and the principles of sustainability, with a focus on the impact of energy systems on the environment, Familiarity with fluid dynamics and mechanical systems, especially in the context of wind turbines, hydroelectric power generation, and other renewable energy systems.

Course Description: This course provides an introduction to renewable power generation systems, including solar, wind, hydroelectric, and bioenergy. Students will explore various sustainable power generation technologies, their design, operation, and integration into existing power grids, while focusing on their environmental and economic impacts.

Course Objectives:To make the students aware and understand

1. Introduce renewable power generation systems and their environmental benefits.
2. Understand the design and working principles of various renewable energy technologies.
3. Analyze the integration of renewable systems into the power grid.
4. Evaluate the sustainability and environmental impacts of different energy systems.
5. Equip students with the skills to design, optimize, and implement sustainable energy systems for real-world applications.

Course Outcomes:		
COs	**After completion of the course students will be able to**	**Bloom's Level**
CO1	**Understand** the principles of sustainability and the global energy transition.	Remember (Level 1)
CO2	**Identify** and assess various renewable energy technologies, such as solar, wind, hydro, geothermal, and biomass.	Understand (Level 2)
CO3	**Design** and analyze the potential for power generation from renewable sources.	Apply (Level 3)
CO4	**Compare** and contrast the advantages and limitations of conventional and sustainable energy technologies.	Analyze (Level 4)
CO5	**Analyze** the environmental, social, and economic impacts of renewable energy systems and evaluate their contributions to mitigating climate change.	Analyze (Level 4)

CO-PO-PSO Mapping														
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO 3**

Chairman, Board of Studies

CO1	3	2	1	2	2	2	1	1	-	-	-	1	1	2
CO2	3	3	3	2	2	2	2	1	-	-	-	2	2	2
CO3	3	3	3	3	3	3	3	2	-	-	-	2	2	2
CO4	3	3	3	2	3	2	2	1	-	-	-	2	1	2
CO5	3	2	3	2	2	2	2	1	-	-	-	3	2	2

Assessment	
CA-1 (a) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
CA-2 (b) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
MSE (c) (20 Marks)	Subjective Test

Course Contents		
Unit 1	**Introduction to power generation** Global and Indian Context: An Examination of Current Power Generation Technologies and Renewable Energy Concepts Introduction to Renewable Energy-Based Power Plants Solar Thermal Power Generation: Exploring the Basics of Solar Thermal Energy Conversion, Design, and Analysis of Solar Thermal Power Plants (including flat plate and concentrator technologies), Overview of Organic Rankine Cycle (ORC), Rankine Cycle (RC), and Stirling Engine Applications.	**6 Hrs**
Unit 2	**Solar Photovoltaic Power Generation** Solar Photovoltaic (PV) Energy Conversion: Understanding PV Fundamentals, PV Power Plant Design, Performance Analysis of Standalone and Grid-Connected PV Systems. Wind Power Generation: Introduction to Wind Turbines, Component Classification and Analysis, Design and Theory of Wind Turbines (Horizontal and Vertical Axis), and Wind Farm Analysis.	**6 Hrs**
Unit 3	**Hydro Power Generation** 00Hydropower Plants: Introduction to Hydro Power Plants, Micro, Mini, and Small Hydro Plants, Hydraulic Turbines, Selection and Design Criteria for Pumps and Turbines, Brief Theory, Design, and Analysis of Hydro Power Plants. Biomass Power Generation: Fundamentals of Bioenergy Production Technologies, Design and Analysis of Biochemical and Thermochemical Reactors for Clean Power Generation and Value-Added Products, Introduction to Integrated Gasification Combined Cycle (IGCC).	**6 Hrs**
Unit 4	**Hydrogen energy and fuel cells** Hydrogen Generation: Importance and Various Generation Routes, Basic Principles and Design of Fuel Cells, Applications, Prospects, and Introduction to Integrated Gasification Fuel Cell (IGFC).	**7 Hrs**

Chairman, Board of Studies

	Geothermal Energy: Fundamentals, Classification, Theory, Design, and Analysis of Geothermal Power Plants.	
Unit 5	**Ocean Thermal Energy** Ocean thermal power plant principles, categorization, theory, design, and analysis Tidal and Wave Energy, Understanding the Fundamentals, Classification, Theory, Design, and Analysis of Wave and Tidal Power Plants. Energy Storage,	**5 Hrs**
Unit 6	**Energy Storage Technologies**: Overview of Thermal, Mechanical, and Electrochemical Energy Storage Systems; Design and Analysis of Various Storage Technologies. Energy Economics Cost Analysis, Financial Metrics (Interest, Accounting Rate of Return, Payback, Discounted Cash Flow, Net Present Value, Internal Rate of Return), Inflation, and Life Cycle Analysis for Energy Systems	**5 Hrs**

Sr.No.	Text Books
1	J. Twidell, T. Weir, Renewable Energy Resources, Taylor and Francis, 4th Edition, 2021
2	G. Boyle (Editor), Renewable Energy: Power for a Sustainable Future, Oxford University press
3	G. N. Tiwari, Solar Energy, Fundamentals, Design, Modeling and Applications, Narosa, 2002.

Sr.No.	Reference Books
1	J. A. Duffie and W. A. Beckman, Solar Engineering of Thermal Processes, John Wiley, 4th Edition
2	R. Gasch, J. Twele, Wind Power Plants: Fundamentals, Design, Construction and Operation, Springer, 2nd Edition, 2012
3	P. Breeze, Hydropower, Elsevier, 1st Edition, 2018.
4	S. C. Bhattacharyya, Energy Economics Concepts, Issues, Markets and Governance, springer, 2nd Edition, 2019
5	S.P. Sukhatme and J.K. Nayak, Solar Energy: Principles of Thermal Collection and Storage, Tata Mc-Graw Hill Education Private Limited, 3rd Edition, 2010.

Sr.No.	Web Resources
1	NPTEL, https://onlinecourses.nptel.ac.in/noc23_ge47/preview

Chairman, Board of Studies

Course Title: Intellectual Property & Rights **Course Code: PS253203**		**Course Category: MDM**
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	CA-1	10 Marks
Tutorial: -----	CA-2	10 Marks
Credits: 03	MSE	20 Marks
Semester: S Y M.Tech. (Semester III)	ESE	60 Marks

Course Prerequisite: Students should have a basic understanding of legal concepts, along with foundational knowledge in the student's academic discipline. Familiarity with research methods and good communication skills are also recommended to help students grasp the principles of intellectual property, innovation, and related legal processes.

Course Description: This course intends to provide students a comprehensive knowledge on the Intellectual Property & Rights. The course focuses on the six topics shown in detailed syllabus.

Course Objectives:

To make the students aware and understand

1. To introduce the fundamental concepts, nature, and importance of Intellectual Property Rights (IPR) and their international framework under TRIPS and WTO
2. To understand various forms of intellectual property such as patents, copyrights, trademarks, designs, and geographical indications
3. To explain the procedures for registration, rights and duties of owners, and legal remedies in cases of infringement.
4. To acquaint students with the legal provisions of the Information Technology Act, 2000, and issues related to cyber laws and e-governance.
5. To develop awareness of contemporary challenges and ethical issues in protecting intellectual property in the digital era.

Course Outcomes:		
COs	**After completion of the course students will be able to**	**Bloom's Level**
CO1	**Explain** the meaning, scope, and significance of Intellectual Property Rights and their international context under TRIPS and WTO.	Understand (Level2)
CO2	**Identify** and differentiate between various types of intellectual property such as patents, copyrights, trademarks, and designs.	Understand (Level2)
CO3	**Describe** the processes for registration, licensing, assignment, and enforcement of IPRs along with the legal remedies for infringement	Understand (Level2)
CO4	**Apply** the knowledge of IPR laws and practices to protect innovations, creative works, and digital assets ethically and legally	Apply (Level3)
CO5	**Analyze** the key provisions of the Information Technology Act,	Analyze

Chairman, Board of Studies

	2000, and their implications for e-commerce, e-governance, and cybercrimes.	(Level4)

CO-PO-PSO Mapping														
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO3**
CO1	3	-	-	3	3	3	-	3	3	3	3	-	3	3
CO2	3	2	-	3	3	3	-	3	3	3	3	2	-	2
CO3	2	-	2	3	2	3	-	2	2	3	3	-	-	2
CO4	3	-	-	3	3	3	-	3	3	2	2	-	2	3
CO5	3	-	-	3	3	3	-	3	3	2	2	-	-	3

Assessment	
CA-1 (a) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
CA-2 (b) (10 Marks)	Subjective Test/Course Project/Assignments/Presentation
MSE (c) (20 Marks)	Subjective Test

Course Contents		
Unit 1	Introduction to IPR: Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights, Introduction to TRIPS and WTO, Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade; Secret and trade dress, Design, Layout Design, Geographical Indication, Plant. Varieties and Traditional Knowledge.	**6 Hrs**
Unit 2	Patent Rights and Copy Rights— Origin, Meaning of Patent, Types, Inventions which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties.	**6 Hrs**
Unit 3	Copy Right—Origin, Definition &Types of Copy Right, Registration procedure, Assignment & licence, Terms of Copy Right, Piracy, Infringement, Remedies, Copy rights with special reference to software.	**6 Hrs**
Unit 4	Trade Marks: Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing Off, Penalties. Domain Names on cyber space.	**6 Hrs**
Unit 5	Design- Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention on design, functions of Design. Semiconductor Integrated circuits and layout design Act-2000.	**6 Hrs**
Unit 6	Basic Tenants of Information Technology Act-2000, IT Act - Introduction, E-Commerce and legal provisions, E- Governance and	**6 Hrs**

Chairman, Board of Studies

	legal provisions, Digital signature and Electronic Signature. Cybercrimes.	

Sr.No.	Text Books
1	Guidebook to Intellectual Property by Sir Robin Jacob
2	Intellectual Property Rights by Asha Vijay Durafe & Dhanashree K. Toradmalle
3	Intellectual Property Rights: Protection and Management by N. K. V. Nithyananda
4	Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets by Deborah E. Bouchoux
5	Introduction to Intellectual Property Rights by Phundan Singh

Sr.No.	Reference Books
1	V. K. Ahuja – Law Relating to Intellectual Property Rights
2	Narayanan P. – Intellectual Property Law
3	Cornish, Llewelyn & Aplin – Intellectual Property: Patents, Copyrights, Trade Marks and Allied Rights
4	Kompal Bansal & Parishit Bansal – Fundamentals of IPR for Engineers
5	Prabhuddha Ganguli – Intellectual Property Rights: Unleashing the Knowledge Economy

Sr.No.	Web Resources
1	NPTEL / SWAYAM – IPR Course modules on IP basics and Indian context. IPR Course on SWAYAM/NPTEL
2	Coursera – IPR Courses – University-level IP courses and specializations IP Courses on Coursera

Chairman, Board of Studies

Course Title: Project-I **Course Code: PS253603**		**Course Category: EL**
Teaching Scheme	**Examination Scheme**	
Practical's/Sessions: 10 Hours/Week	CA-1	25 Marks
Credits: 10	CA-2	25 Marks
Semester: S Y M.Tech. (Semester III)	ESE	50 Marks

Course Prerequisite: Basic understanding of core subjects in specialization, Ability to access, and interpret scientific literature, Exposure to technical report writing and presentation.

Course Description: Project-I is an integral part of the final project work. In this, the student shall complete the partial work of the project which will consist of problem statement, literature review, project overview, scheme of implementation that may include mathematical model/SRS/UML/ERD/block diagram/ PERT chart, and layout and design of the proposed system/work. As a part of the progress report of project-I work; the candidate shall deliver a presentation on progress of the work on the selected dissertation topic. The student shall submit the duly certified progress report of project - I in standard format for satisfactory completion of the work duly signed by the concerned guide and head of the department/institute.

Course Objectives:

1. To enable students to identify and define a research/industrial problem.
2. To develop skills for conducting a comprehensive literature review.
3. To formulate objectives, scope, and methodology for the proposed work.
4. To strengthen technical writing, presentation, and project planning skills.
5. To prepare a well-structured project synopsis in line with research/industry requirements.

Course Outcomes:		
COs	**After completion of the course students will be able to**	**Bloom's Level**
CO1	**Identify** and define a research/engineering problem relevant to the specialization.	Apply (Level-3)
CO2	**Develop** project planning with milestones, deliverables, and resources.	Apply (Level-3)
CO3	**Perform** a critical literature review and identify research gaps.	Analyze (Level-4)
CO4	**Formulate** clear objectives, scope, and methodology for the project proposal.	Evaluate (Level-5)
CO5	**Prepare** and present a structured project proposal/synopsis effectively in written and oral formats.	Create (Level-6)

CO-PO-PSO Mapping													
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO 3**

Chairman, Board of Studies

CO1	2	1	2	-	-	-	1	1	2	2	2	2	-	3
CO2	2	1	2	1	-	-	1	1	2	3	2	2	-	3
CO3	2	2	3	2	1	-	1	1	2	3	2	3	1	3
CO4	1	1	2	3	2	-	1	3	2	2	2	3	1	2
CO5	1	1	2	1	1	-	2	3	3	3	1	2	-	3

Course Contents
Students can take Industry Internship along with Project –I. Students must maintain regular reporting with Dissertation supervisor regarding status of Project –I is an integral part of the final project work. In this, the student shall complete the partial work of the project which will consist of problem statement, literature review, project overview, scheme of implementation that may include mathematical model/block diagram/ PERT chart, and layout and design of the proposed system/work. As a part of the progress report of project-I work; the candidate shall deliver a presentation on progress of the work on the selected dissertation topic. It is desired to publish the paper on the state of the art on the chosen topic in international conference/ journal. The student shall submit the duly certified progress report of project -I in standard format for satisfactory completion of the work duly signed by the concerned guide and head of the department/institute.

Assessment	
Project-I will have internal marks of 50 and a Semester-end examination of marks 50. Semester end examination will be conducted by a committee consisting of three faculty members. The students are required to bring the report completed in all respects duly authenticated by the respective guide and head of the department, before the committee. Students individually will present their work before the committee. The committee will evaluate the students individually and marks shall be awarded as follows.	
CA-I (a) (25 M)	Review-I: 25 Marks (Concept/knowledge in the topic = 10 marks, Literature-05 marks)
CA-II (b) (25 M)	Review-II: 25 Marks (Report writing & Presentation =25 Marks)
Practical/ viva voce (c) (50M)	50 Marks (Individual evaluation through viva voce / test (50marks)
Total (d) (100 M)	100 Marks

Chairman, Board of Studies

Course Title: Project-II **Course Code: PS254604**		**Course Category: EL**
Teaching Scheme	**Examination Scheme**	
Practical's/Sessions: 20 Hours/Week	CA-1	50 Marks
Credits: 20	CA-2	50 Marks
Semester: S Y M.Tech. (Semester IV)	ESE	100 Marks

Course Prerequisite: Basic understanding of core subjects in specialization, Ability to access, and interpret scientific literature, Exposure to technical report writing and presentation.

Course Description: M.Tech Project–II (Dissertation) is a culmination of the postgraduate program where students demonstrate their ability to independently identify, formulate, and solve research or industry-oriented engineering problems. The dissertation involves systematic literature review, problem definition, research methodology, experimentation/simulation, result analysis, and formulation of conclusions. The course aims to develop research aptitude, technical depth, and professional presentation skills aligned with the Program Outcomes (POs).

Course Objectives:

1. To enable students to undertake independent research or applied problem-solving in their domain.
2. To develop analytical and experimental skills through design, simulation, or experimental validation.
3. To strengthen technical communication through research publications and dissertation writing.
4. To encourage innovative thinking, ethical research practices, and professional responsibility.

Course Outcomes:		
COs	**After completion of the course students will be able to**	**Bloom's Level**
CO1	**Formulate** and define research problem with appropriate objectives and scope.	Apply (Level 3)
CO2	**Conduct** experiments/simulations and analyze results with proper validation.	Apply (Level 3)
CO3	**Critically** review and analyze literature to identify research gaps.	Analyze (Level 4)
CO4	**Develop** methodology / experimental/ simulation framework for problem- solving.	Evaluate (Level 5)
CO5	**Prepare** dissertation and communicate technical findings effectively.	Create (Level 6)

CO-PO-PSO Mapping													
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO 3**

Chairman, Board of Studies

CO1	2	2	3	1	-	-	1	1	1	2	3	3	1	3
CO2	2	2	2	1	-	-	1	1	1	2	3	3	1	3
CO3	3	3	3	2	1	-	1	1	1	2	3	3	2	3
CO4	3	3	3	2	1	-	1	1	1	2	3	3	2	3
CO5	1	1	2	1	1	-	1	3	3	3	3	2	1	3

Course Contents
In Project - II, the student shall complete the remaining part of the project, which will consist of the simulation/ analysis/ synthesis/ implementation / fabrication of the proposed project work, work station, conducting experiments and taking results, analysis and validation of results and drawing conclusions. It is mandatory to publish the paper on the state of the art on the chosen topic in international conference/ journal. The student shall prepare the duly certified final report of project work in standard format for satisfactory completion of the work duly signed by the concerned guide and head of the department/institute.

Assessment	
Project-II will have internal marks 100 and Semester-end examination marks 100. Internal examination will be conducted by a committee consisting of five faculty members. The students are required to bring the report completed in all respects duly authenticated by the respective guide and head of the department, before the committee. Students individually will present their work before the committee. The committee will evaluate the students individually and internal marks shall be awarded as follows.	
CA-I (a) (25M)	Review-I: 25 Marks
CA-II (b) (25M)	Review-II: 25 Marks
Guide Evaluation (c) (50M)	50 Marks
External Examination Marks:	
DPAC Evaluation (d) (30M)	30 Marks
External examiner evaluation (e) (22 M)	20 Marks
Guide Evaluation (f) (50M)	50 Marks
Total (a to f)	200 Marks

Chairman, Board of Studies

Course Title: Communication Skill and Technical Writing **Course Code: PG254701**		**Course Category: CC**
Teaching Scheme	**Examination Scheme**	
Lectures: 02 hrs/ week	CA-1	25 Marks
Tutorial: -----	CA-2	25 Marks
Credits: AU	MSE	-
Semester: S Y M.Tech. (Semester IV)	ESE	-

Course Prerequisite: Basic English composition or introductory technical communication; familiarity with engineering fundamentals

Course Description: This course equips engineering students with essential communication skills for professional and academic success, focusing on technical writing and oral presentations. Students learn to craft clear, concise technical reports, research proposals, and documentation, as well as deliver effective presentations tailored to engineering. Topics include audience analysis, research document structure, visual aids, professional correspondence, and ethical communication. Through hands-on practice for drafting technical research papers, peer reviews, and research projects, students would be able to apply skills to real-world engineering contexts, such as presenting research. The course prepares students for thesis work, industry reports, and collaborative engineering environments.

Course Objectives:

To make the students aware and understand

1. Understand the principles, structure, and ethical conventions of research writing to support effective documentation in engineering applications.
2. Formulate research problems and develop structured technical documents, including abstracts, introductions, and methodologies, for engineering contexts.
3. Apply data collection and analysis techniques, such as questionnaires and observation methods, to enhance research writing for engineering projects.
4. Produce professional correspondence and technical papers formatted for submission to engineering platforms

Course Outcomes:		
COs	**After completion of the course students will be able to**	**Bloom's Level**
CO1	**Explain** the principles and conventions of research writing, including its purpose, structure, and ethical considerations, to support engineering applications.	Understand (Level 2)
CO2	**Apply** data collection and analysis techniques, including questionnaire design and observation methods, to support research writing in engineering projects.	Applying (Level 3)
CO3	**Formulate** research problems and structure technical documents.	Creating (Level 6)
CO4	**Produce** professional correspondence and prepare technical	Creating

Chairman, Board of Studies

	papers for submission to engineering platforms	(Level 6)

CO-PO-PSO Mapping														
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**	**PSO3**
CO1	1	1	-	-	-	2	2	3	-	2	-	3	2	-
CO2	2	3	2	2	1	1	2	2	-	2	1	3	-	-
CO3	2	2	2	3	2	1	2	1	1	1	1	3	-	-
CO4	-	1	1	1	2	2	1	1	2	3	1	-	-	3

Assessment	
CA-1 (a)	Paper writing/ Presentations
CA-2 (b)	Paper publication /Paper submission

Course Contents		
Unit 1	**Fundamentals of Research Writing** Introduction to research writing - Knowing the details of research writing - Planning the purpose and material - Practicing for the audience and content delivery. Different Methods in Research Writing Nature and meaning of research methods - Types of research - pure and applied research - Types of communication research – Quantitative, Qualitative and Rhetorical - Questionnaire and observation methods - Data collection and data analysis - Thesis/Synopsis writing - Structure and importance	**6 Hrs**
Unit 2	**Mechanics and Conventions of Research Writing** Research writing in broader spectrum - The tone -The language - Conventions of research – Evidence-based arguments - Thesis-driven analysis – Complexity and higher- order thinking. Components of Research Writing: Formatting a research paper – Title page – Abstract – Introduction – Methodology – Conclusion – Proof reading – Citing sources	**4 Hrs**
Unit 3	**Communication and Communication Processes** Introduction to Communication, Forms and functions of Communication, Barriers to Communication and overcoming them, Verbal and Non-verbal Communication **Reading Skills:** Introduction to Reading, Types of Readers and Reading, Barriers to Reading, Strategies for Reading, Comprehension. **Listening Skills**: Importance of Listening, Types of Listening, Barriers to Listening. **Speaking & Verbal & Non-verbal Communication**:	**6 Hrs**

Chairman, Board of Studies

	Use of Language in Spoken Communication, Principles and Practice of Group Discussion, Public Speaking (Addressing Small Groups and Making Presentation), Interview Techniques, Appropriate Use of Non-verbal Communication, Presentation Skills, Extempore, Elocution.	
Unit 4	**Professional Correspondence:** Writing emails, memos, and cover letters for engineering contexts	**2 Hrs**
Unit 5	**Technical Paper Submission Platforms for Engineering:** IEEE Xplore (Journals and Conferences), Elsevier Journals (ScienceDirect), Springer Journals etc	**2 Hrs**

Sr.No.	Text Books
1	Hamlin, A., Rubio, C., & DeSilva, M. (2017). Technical Writing. Open Oregon Educational Resources.
2	Intellectual Property Rights by Asha Vijay Durafe & Dhanashree K. Toradmalle
3	Intellectual Property Rights: Protection and Management by N. K. V. Nithyananda
4	Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets by Deborah E. Bouchoux
5	Introduction to Intellectual Property Rights by Phundan Singh

Sr.No.	Reference Books
1	V. K. Ahuja – Law Relating to Intellectual Property Rights
2	Narayanan P. – Intellectual Property Law
3	Cornish, Llewelyn & Aplin – Intellectual Property: Patents, Copyrights, Trade Marks and Allied Rights
4	Kompal Bansal & Parishit Bansal – Fundamentals of IPR for Engineers
5	Prabhuddha Ganguli – Intellectual Property Rights: Unleashing the Knowledge Economy

Sr.No.	Web Resources
1	Course on SWAYAM/NPTEL
2	IP Courses on Coursera

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