



Established: 1999

Annasaheb Dange College of Engineering and Technology

Ashta - 416301, Dist.: Sangli, Maharashtra
(An Empowered Autonomous Institute)



F.Y. M. Tech. - Computer Aided Structural Engineering

[PG Certificate] Semester - I

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	RM	T1	OSERM501	Research Methodology and IPR	3	1	-	-	4	40	20	40	-	-
02	MC	T1	OSEMC502	Numerical Methods in Structural Engineering	3	1	-	2	4	40	20	40	-	-
03	PC	LIT1	OSEPC503	Mechanics of Structures	3	-	2	2	4	40	20	40	50	50
04	PE	LIT1	OSEPE5**	Program Elective - I	3	1	2	2	5	40	20	40	50	50
05	PE	LIT2	OSEPE5**	Program Elective - II	3	1	2	2	5	40	20	40	50	50
06	MA	T2	OSEMA508	English for Research Paper Writing	2	-	-	-	-	-	50	-	-	-
Total					17	4	6	8	22					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination, CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : $\geq 8 / 20$	MSE + ESE (Theory) : $\geq 32 / 80$	TA (Theory) / CIE (Lab) : $\geq 20 / 50$	ESE (Lab) : $\geq 20/50$
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PE Bouquet:

Program Elective-I	Program Elective-II
OSEPE504: Advanced Design of RC Structures	OSEPE506: Dynamics of Structures
OSEPE505: Advanced Solid Mechanics	OSEPE507: Design of Bridges

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F.Y. M. Tech. - Computer Aided Structural Engineering

[PG Certificate] Semester - II

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	OE	T1	OSEOE509	Open Elective - Optimization Techniques	3	-	-	-	3	40	20	40	-	-
02	PC	LIT2	OSEPC510	Finite Element Method	3	-	2	2	4	40	20	40	50	-
03	PC	LIT1	OSEPC511	Advanced Design of Steel Structures	3	1	2	2	5	40	20	40	50	50
04	PE	LIT1	OSEPE5**	Program Elective - III	3	-	2	2	4	40	20	40	50	50
05	PE	LIT2	OSEPE5**	Program Elective - IV	3	-	2	2	4	40	20	40	50	-
06	MA	L2	OSEMA516	Seminar	-	-	4	-	2	-	-	-	50	-
07	VS	T2	OSEVSS17	Pedagogy Studies	2	-	-	-	-	-	50	-	-	-
Total					17	1	12	8	22					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination, CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria		TA (Theory): $\geq 8 / 20$	MSE + ESE (Theory): $\geq 32 / 80$	TA (Theory) / CIA (Lab): $\geq 20 / 50$	ESE (Lab): $\geq 20 / 50$
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PE Bouquet:

Program Elective-I	Program Elective-II
OSEPE512: Advanced Design of Foundations	OSEPE514: Advanced Design of Prestressed Concrete
OSEPE513: Computer Aided Analysis & Design	OSEPE515: Smart Materials and Structures

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Exit after F.Y. M. Tech. - Computer Aided Structural Engineering

Additional Credits to qualify for P. G. Diploma

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)			
										Theory		Laboratory	
										MSE	TA	ESE	CIA
01	VS	L1	0SEVS518	Domain Specific Internship for 8 Weeks	-	-	20	-	10	-	-	50	50
Total					-	-	20	-	10				
Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination, CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination													
Minimum Passing Criteria					TA (Theory): $\geq 8 / 20$		MSE + ESE (Theory): $\geq 32 / 80$		TA (Theory) / CJE (Lab) : $\geq 20 / 50$		ESE (Lab) : $\geq 20 / 50$		

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S.Y. M. Tech. - Computer Aided Structural Engineering
[PG Certificate] Semester - III

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)			
										Theory			Laboratory
										MSE	TA	ESE	CIA
01	SL	LIT2	0SESL6**	Self-Learning Course - I	3	-	2	2	4	40	40	50	-
02	VS	L1	0SEVS603	Dissertation Phase - I	-	-	24	4	12	-	-	-	50
03	MA	L2	0SEMA604	Internship	-	-	-	-	-	-	-	-	50
Total					3	-	26	6	16				

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria TA (Theory): $\geq 8 / 20$ MSE + ESE (Theory): $\geq 32 / 80$ TA (Theory) / CIE (Lab): $\geq 20 / 50$ ESE (Lab): $\geq 20 / 50$

S.Y. M. Tech. - Computer Aided Structural Engineering
[PG Certificate] Semester - IV

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)			
										Theory			Laboratory
										MSE	TA	ESE	CIA
01	SL	LIT2	0SESL6**	Self-Learning Course - II	3	-	2	2	4	40	40	50	-
02	PC	L1	0SEVS607	Dissertation Phase - II	-	-	32	4	16	-	-	-	50
Total					-	-	34	6	20				

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria TA (Theory): $\geq 8 / 20$ MSE + ESE (Theory): $\geq 32 / 80$ TA (Theory) / CIE (Lab): $\geq 20 / 50$ ESE (Lab): $\geq 20 / 50$

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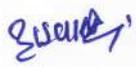


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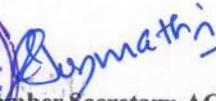
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 Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist.: Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Civil Engineering				
Course Information:				
Class, Semester	F. Y. M. Tech, Semester - I		Category	RM
Course Code, Course Title	0SERM501, Research Methodology and IPR		Type	T1
Prerequisites	----			
Teaching Scheme (per week)	Lecture	Tutorial	Practical	Self-Study
	3	1	--	--
Examination Scheme (Marks)	Theory	MSE	TA	ESE
		40	20	40
Practical	CIA	ESE		
		--	--	
Course Outcomes (COs):				
Upon successful completion of this course, the student will be able to:				
CO1	Formulate the research problem through fundamentals of research and literature review.			
CO2	Identify and apply research design principles and make use of data collection and analysis techniques.			
CO3	Apply quantitative methods to solve research problem.			
CO4	Interpret the research problem into registering IPR and filing patents.			
Syllabus:				
Module	Contents			Lecture Hours
I	Introduction to Research Definitions and Characteristics of Research, Motivation and Objectives, Research Methods vs. Methodology. Types of Research: Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, Concept of Applied and Basic Research Process, Criteria of Good Research.			8
II	Literature Review: Objectives of Review of Literature, Importance of Literature Review in Defining a Problem, Primary and Secondary Sources, Reviews, Treatise, Monographs, Patents, Web as a Source, searching in the Web, Critical Literature Review, Identifying Gap Areas from Literature Review and Research Database, Development of Working Hypothesis.			7
III	Research Design Basic Principles, Need of Research Design, Features of Good Design, Different Research Designs, Experimental Designs, Research Databases, Development of Models, Developing a Research Plan, Exploration, Description, Diagnosis, and Experimentation. Data Collection and Analysis: Primary and Secondary Data, Methods of Data Collection, Sampling, Methods, Data Processing and Analysis Strategies and Tools,			8
IV	Quantitative Methods for Problem Solving Basic Statistical Distributions and their Applications (No Derivations): Binomial, Poisson, Normal and their Applications in Research Studies. Fundamentals of Statistical Analysis and Inference, Multivariate methods, Concepts of Correlation and Regression Analysis, Fundamentals of Time Series Analysis and Spectral Analysis.			8
V	Intellectual Property Rights (IPR) Intellectual Property Rights and Patent Law, Drafting of Patents, Patent Types, Commercialization, Copy Right, Royalty, Trade Related aspects of Intellectual Property Rights (TRIPS).			7
VI	Copyrights and Trademarks Agreement, Features of the Agreement, Protection of Intellectual Property under TRIPS, Copyright and Related Rights, Trademarks, Geographical indications, Industrial Designs, Patents, Patentable Subject Matter, Rights Conferred, Exceptions, Term of protection, Conditions on Patent Applicants, Process Patents			7
Total Lecture Hours				45


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Text Books	
1.	Deepak Chawla and Neena Sondhi, Research Methodology: concepts and cases Vikas Publishing House Pvt. Ltd. Editon 5 th , 2011
2.	Sekaran Research Methods for Business Wiley, India Editon 4 th , 2013
3.	Dr. C. R. Kothari, Research Methodology: Methods and Trends, New Age International, Publishers., 3 rd Edition 2018
4.	Louis Cohen, Manion, Morrison, Rout ledge, Research Methods in Education, (Taylor & Francis Group) Cambridge University Press India Pvt. Ltd. 2 nd Edition, 2012
5.	John Best and James Kahn Research in Education Prentice Hall of India Pvt. Ltd. 4 th Edition, 2011
References:	
1.	Anderson, T. W., An Introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt., Ltd., New Delhi, 4 th Edition 2012
2.	Sinha, S.C. and Dhiman, A.K, Research Methodology, Ess Publications, 2 nd Edition, 2012
3.	Fink, A, Conducting Research Literature Reviews: From the Internet to Paper Sage Publications, 2 nd Edition, 2019
4.	Subbarau NR, Handbook on Intellectual Property Law and Practice Publishing Private, Limited., 2008
5.	Shashi k Gupta and Praneet Rangi. Research Methodology, 6th edition, Kalyani Publishers, 6 th , 2012
Online Learning Resources:	
1.	Quantitative and Mixed Methods Research for Management, by Prof. Rabi N Subudhi, Prof. Sumita Mishra KIIT, (Deemed to be) University Bhubaneswar, KIIT (Deemed to be) University Bhubaneswar
2.	MCO-03: Research Methodology and Statistical Analysis by Prof. Subodh Kesharwani Indira Gandhi National Open University, New Delhi
3.	MGPE-015 Introduction to Research Methods (Elective Course) by Dr. Sadananda Sahoo Indira Gandhi National Open University, New Delhi



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		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist.: Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Civil Engineering					
Course Information:							
Class, Semester		F. Y. M. Tech, Semester - I				Category	MC
Course Code, Course Title		0SEMC502, Numerical Methods in Structural Engineering				Type	T1
Prerequisites		-----					
Teaching Scheme (per week)		Lecture	Tutorial	Practical	Self-Study	Credits	
		3	1	--	2	4	
Examination Scheme (Marks)		Theory	MSE	TA	ESE	Practical	CIA
			40	20	40		ESE
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Course Outcomes (COs):							
Upon successful completion of this course, the student will be able to:							
CO1	Apply numerical methods to solve linear and nonlinear algebraic equations, including direct and iterative techniques for solving sparse linear systems and root-finding methods.						
CO2	Analyze and implement numerical approaches for solving Ordinary Differential Equations (ODEs) using explicit and implicit methods, Runge-Kutta schemes, and finite difference methods.						
CO3	Understand and apply probability, statistics, and reliability analysis in structural engineering, including probability distributions, statistical methods, and reliability-based design concepts.						
CO4	Use numerical integration techniques, including Newton-Cotes schemes, Gauss-quadrature, and multiple integral approaches, for solving engineering problems.						
CO5	Implement computational methods in structural engineering applications, such as nonlinear structural analysis, earthquake engineering, and Structural Health Monitoring (SHM).						
Syllabus:							
Module	Contents						Lecture Hours
I	Linear Algebraic Equations and Eigen Analysis System of linear equations: existence and classification of solutions, direct (matrix decomposition) and iterative methods, special systems (block-diagonal, triangular, sparse), Jacobi, Gauss-Seidel, SOR methods and convergence, ill-conditioning, Eigen value problems by Jacobi and basic methods.						7
II	Nonlinear Algebraic Equations [Root Locating methods] Root-finding: successive substitutions, secant, regulafalsi, modified Newton's, quasi-Newton (Broyden), optimization-based approach and Leven berg-Marquardt method.						7
III	Ordinary Differential Equations and Approximations Solutions ODEs (IVPs) using Taylor series, Runge-Kutta, multi-step methods; finite difference for BVPs; polynomial approximation and interpolation, least squares method, Gauss-Newton for parameter estimation.						8
IV	Probability, Statistics, Reliability Analysis Probability basics and applications in engineering, Statistical parameters, distributions, methods and applications. Reliability analysis in structural engineering.						8
V	Numerical Integration Newton-Cotes schemes, Romberg, Gauss-quadrature, Multiple Integrals.						8
VI	Structural Engineering Applications Digital Signal Processing, Nonlinear structural analysis, Structural dynamics and Earthquake engineering applications. SHM						7
Total Lecture Hours						45	
Text Books							
1. Gourdin, A., & Boumhrat, M. (2017). Applied numerical methods (4th ed.). Prentice Hall India.							
2. Hoffman, J. D. (2014). Numerical methods for engineers and scientists (2nd ed.). Marcel Dekker							
3. Chapra, S. C., & Canale, R. P. (2012). Numerical methods for engineers (7th ed.). McGraw-Hill							

S. S. S.
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R. Mathin
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References:
1. Strang, G. (n.d.). Computational science and engineering. Wellesley–Cambridge Press.
2. Strang, G. (2019). Linear algebra and its applications (4th ed.). Wellesley–Cambridge Press.
3. Philips, G. M., & Taylor, P. J. (2016). Theory and applications of numerical analysis (2nd ed.). academic Press
Online Learning Resources:
1. Numerical Methods in Civil Engineering (Prof. A. Deb, IIT Kharagpur) Course homepage (includes syllabus, downloads, lecture videos) https://nptel.ac.in/courses/105105043
2. NPTEL Course on Numerical Methods, by Prof. Ameeya Kumar Nayak, Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107105
3. NPTEL Course on Matrix Analysis with Application, by Prof. S. K. Gupta, Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107112
4. NPTEL Course on Mathematics-III, by Prof. Durga C Dalal, Dr. M. Guru Prem Prasad, IIT Guwahati https://nptel.ac.in/courses/122103012



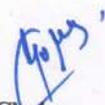
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 Department of Civil Engineering



Course Information:							
Class, Semester	F. Y.M. Tech, Semester - I					Category	PC
Course Code, Course Title	0SEPC503, Mechanics of Structures					Type	LIT1
Prerequisites	-----						
Teaching Scheme (per week)	Lecture	Tutorial	Practical	Self-Study	Credits		
	3	--	2	2	4		
Examination Scheme (Marks)	Theory	MSE	TA	ESE	Practical	CIA	ESE
		40	20	40		50	50

Course Outcomes (COs):
 Upon successful completion of this course, the student will be able to:

CO1	Explain the concepts of Influence Line Diagrams (ILD) and apply Müller-Breslau's principle for plotting ILD's for indeterminate structures.
CO2	Analyze the structural behavior of beams curved in plan including determinate, indeterminate, and bent beams under different loading conditions.
CO3	Formulate and solve the governing differential equations of beam-columns subjected to axial load along with various transverse loading and support conditions.
CO4	Analyze infinite, semi-infinite, and finite beams on elastic foundation subjected to various loadings and boundary conditions.
CO5	Evaluate forces and displacements for beams, frames, and trusses under various loading conditions by flexibility matrix method.
CO6	Formulate and implement the stiffness matrix method using equilibrium conditions to analyze indeterminate beams, frames, and trusses.

Syllabus:

Module	Contents	Lecture Hours
I	Influence line Diagrams for Indeterminate Structures Concept of ILD, Muller-Breslau's principle and its application for propped cantilever beams, fixed beams and continuous beams. ILD for two hinged arches.	7
II	Beams Curved in Plan Structural behavior of curved beams in plan under loading normal to its plane, Analysis of determinate and indeterminate beams curved in plan, bent beams.	7
III	Beam Columns Concept of geometric and material nonlinearity, governing differential equation. Analysis of beam-columns subjected to different loadings and support conditions.	8
IV	Beams on Elastic Foundations Basic concept of beams on elastic foundation, analysis of infinite, semi-infinite and finite beams under various types of loads and boundary conditions.	8
V	Matrix method of analysis: Flexibility Method Flexibility coefficient, development of flexibility matrix equations using compatibility conditions, flexibility matrix, equivalent loads, applications to beams, frames and trusses, lack of fit, temperature stresses.	8
VI	Matrix method of analysis: Stiffness Method Stiffness coefficient, development of stiffness matrix equations using equilibrium conditions, Element approach, stiffness matrix, equivalent loads, applications to beams, frames and trusses.	7
Total Lecture Hours		45

Laboratory Work with CO Mapping:

Sr. No.	Title of Lab Work	CO Mapped
1	To study behavior of propped cantilever and fixed beams under moving loads using influence line diagrams.	1

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2	To construct influence line diagrams for reactions at supports, S.F., and B.M. at specified section for continuous beams.	1
3	To develop coefficients for Maximum mid-span B.M., Support B.M. T.M. for various numbers of columns. Also evaluate the angle for maximum twisting moments.	2
4	To analyze beams curved in plan subjected to loads normal to its plane.	2
5	To analyze the buckling behavior of a beam-column under axial compression and transverse load.	3
6	To study the behavior of infinite long beam resting on an elastic foundation under different loading conditions.	4
7	To develop expressions for deflection, pressure, slope, bending moment and shear force, also draw corresponding diagrams for infinite/semi-infinite beams resting on an elastic foundation under different loading conditions.	4
8	To analyze indeterminate beams by using flexibility matrix method.	5
9	To analyze indeterminate trusses by using flexibility matrix method.	5
10	To develop element stiffness matrix for truss element, beam element and frame element.	6
11	To determine displacements and reactions of beams using direct (element approach) stiffness method.	6
12	To determine the joint displacements and forces in a member of trusses using the stiffness method.	6
Total Practical Sessions		15
Total Tutorial Hours		30
Text Books		
1. Timoshenko, S.P., & Gere, J.M., Mechanics of Materials, 3rd Edition, McGraw-Hill, 2009.		
2. Hibbeler, R.C., Structural Analysis, 10th Edition, Pearson, 2016.		
3. Popov, E.P., Engineering Mechanics of Solids, 2nd Edition, Prentice Hall, 1998.		
4. Devdas Menon, Structural Analysis, 2nd Edition, Narosa Publishing, 2012.		
5. Reddy, C.S., Basic Structural Analysis, 2nd Edition, Tata McGraw-Hill, 2010.		
6. Krishna Raju N., "Advanced Mechanics of Solids and Structures", McGraw-Hill Education, 08-Nov-2018 - Technology & Engineering		
References:		
1. Weaver, W., & Gere, J.M., Matrix Analysis of Framed Structures, 2nd Edition, CBS Publishers, 1990.		
2. Bansal, R.K., A Textbook of Strength of Materials, 9th Edition, Laxmi Publications, 2018.		
3. Ramamrutham, S., Theory of Structures, 15th Edition, Dhanpat Rai & Sons, 2015.		
4. Gere, J.M., Mechanics of Materials, 7th Edition, Cengage Learning, 2012.		
5. Jain, A.K., Strength of Materials, 1st Edition, Khanna Publishers, 2011.		
Online Learning Resources		
1. https://www.youtube.com/watch?v=Vqgk4mXU-M8		
2. https://www.youtube.com/watch?v=jYz0nE_5D6U		
3. https://www.youtube.com/watch?v=L7F0OY6IulM		
4. https://www.youtube.com/watch?v=R5UeeWZg8q8		
5. https://www.youtube.com/watch?v=0fIUw0XQh1g		
6. https://www.youtube.com/watch?v=6hxS5IDc2U0		
7. https://www.youtube.com/watch?v=H6rR6EBiZJc		
8. https://www.youtube.com/watch?v=jWdn7cG6uh0		
9. https://www.youtube.com/watch?v=QHh9zUjlfYg		
10. https://www.youtube.com/watch?v=X4WCEcOYp3o		
11. https://www.youtube.com/watch?v=e8xD1v3pGD0		
12. https://www.youtube.com/watch?v=Zq2R9jZf0e4		

Elisabeth
Member Secretary-BoS

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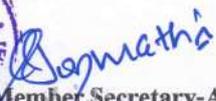
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		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist.: Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Civil Engineering				
Course Information:						
Class, Semester		F.Y.M. Tech, Semester - I			Category	PE
Course Code, Course Title		0SEPE504, Advanced Design of RC Structures			Type	LIT1
Prerequisites						
Teaching Scheme (per week)		Lecture	Tutorial	Practical	Self-Study	Credits
		3	1	2	2	5
Examination Scheme (Marks)		Theory	MSE	TA	ESE	Practical
			40	20	40	CIA
						50
						ESE
						50
Course Outcomes (COs):						
Upon successful completion of this course, the student will be able to:						
CO1	Analyze flat and circular slabs under various loading conditions by using IS codes and structural principles.					
CO2	Interpret grid slabs and folded plates considering load distribution and deflection by considering structural efficiency.					
CO3	Design combined footings and raft foundations based on superstructure loads and soil interaction by using IS code.					
CO4	Determine dimensions of overhead water tanks and their staging for wind and seismic loads by ensuring structural stability.					
CO5	Evaluate thermal stresses, wind and seismic loads for silos, bunkers, and chimneys by considering lateral pressure theories.					
Syllabus:						
Module	Contents					Lecture Hours
I	Analysis and Design of Advanced Slab Systems Analysis and design of Flat slabs and circular slabs using direct design and equivalent frame methods, Yield Line Theory, behavior under gravity and lateral loads.					7
II	Analysis and Design of Grid Slabs and Folded Plates Load transfer mechanisms, IS code provisions, advantages in large-span structures, Analysis and design of grid slab, design of folded plates.					7
III	Design of Special Foundations Analysis and design of combined footing & raft foundation.					8
IV	Retaining Structures Analysis and design of Rectangular and Circular Overhead Water Tanks, Underground Water Tanks considering hydrostatic pressure, Crack Control, Waterproofing, IS 3370 provisions, staging analysis for wind & seismic loads.					8
V	Design of Silos, Bunkers, and Hoppers Silos and bunkers-lateral pressure as per Johnson's and Airy's theory, design consideration for square, rectangular shapes design of hoppers.					8
VI	Chimney Design Chimney- Design factors thermal stresses its components platform and safety ladders steel stacks, refractory lining, caps and foundations.					7
Total Lecture Hours					45	
List of Experiments with CO Mapping:						
Sr. No.	Title of Lab Work					CO Mapped
1	Design of a Flat Slab.					1
2	Design of Folded Plates.					2
3	Design of Combined Footing.					3
4	Design of Raft Foundation.					3


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5	Design of Overhead Water Tank.	4
6	Design of Underground Water Tank.	4
7	Design of Silos.	5
8	Design of Bunkers.	5
9	Analysis and Design of Grid Slab.	1,2
10	Design of R.C.C. Chimney.	5
Total Practical Sessions		15
Total Practical Hours		30
Text Books		
1.	Ashok K. Jain, Reinforced Concrete: Limit State Design, 5th Edition, New Chand & Bros., Roorkee, 2017.	
2.	P.C. Varghese, Advanced Reinforced Concrete Design, 2nd Edition, Prentice Hall of India, Delhi, 2013.	
3.	N. Krishnaraju, Advanced Reinforced Concrete Design, 3rd Edition, CBS Publishers & Distributors, Delhi, 2017.	
4.	N.C. Sinha and S.K. Roy, Fundamentals of Reinforced Concrete, 5th Edition, S. Chand & Co. Ltd., New Delhi, 2014.	
5.	S.S. Bhavikatti, Advanced R.C.C. Design, 5th Edition, New Age International Publishers, 2017.	
6.	S.N. Manohar, Tall Chimneys: Design and Construction, 2nd Edition, Tata McGraw-Hill, 2013.	
References:		
1.	B.C. Punmia and Ashok Kumar Jain, Comprehensive R.C.C. Designs, 5th Edition, Laxmi Publications, 2015.	
2.	H.J. Shah, Reinforced Concrete, 2nd Edition, Charotar Publishers, 2014.	
Codes:		
1.	IS:456-2000, Indian Standard Code of Practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi.	
2.	IS:1893-2002, Indian Standard Criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standards, New Delhi.	
3.	IS:3370, Indian Standard Code of Practice for Concrete Structures for Storage of Liquids, Bureau of Indian Standards, New Delhi.	
4.	IS:2210, Indian Standard Criteria for Design of Reinforced Concrete Shell Structures and Folded Plates, Bureau of Indian Standards, New Delhi.	
5.	IS:4998 (Part 1)-1992, Indian Standard Criteria for Design of Reinforced Concrete Chimneys, Bureau of Indian Standards, New Delhi.	
6.	IS:456-2000, Indian Standard Code of Practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi.	
Online Learning Resources		
1.	NPTEL Online Certification, Advanced Reinforced Concrete Design – https://nptel.ac.in/courses/105105182	
2.	NPTEL Online Certification, Structural Analysis – II – https://nptel.ac.in/courses/105105108	
3.	Coursera, Fundamentals of Concrete Structures for Practicing Engineers – https://www.coursera.org/	
4.	MIT Open Course Ware, Structural Engineering Design – https://ocw.mit.edu	
5.	IIT Kharagpur e-Learning Portal, Design of Reinforced Concrete Structures – https://ocw.iitkgp.ac.in	



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		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist.: Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Civil Engineering					
Course Information:							
Class, Semester		FY. M. Tech, Semester – I				Category	PE
Course Code, Course Title		0SEPE505, Advanced Solid Mechanics				Type	LIT1
Prerequisites		---					
Teaching Scheme (per week)		Lecture	Tutorial	Practical	Self-Study	Credits	
		3	1	2	2	5	
Examination Scheme (Marks)		Theory	MSE	TA	ESE	Practical	CIA
			40	20	40		50
Examination Scheme (Marks)						50	50
Course Outcomes (COs):							
Upon successful completion of this course, the student will be able to:							
CO1	Explain fundamental concepts of stress, strain, equilibrium, and compatibility to understand behavior of elastic solids under static conditions.						
CO2	Apply elasticity principles to analyze stress and strain in solids for two- and three-dimensional conditions using Airy stress functions and torsion theory.						
CO3	Use energy methods to determine displacements and internal forces in structures for static equilibrium using virtual work and minimum potential energy principles.						
CO4	Evaluate plastic behavior of materials to predict yield and post-yield performance under loading using yield criteria such as von Mises and Tresca.						
CO5	Analyze fracture mechanics parameters to assess crack growth and failure risk in structural materials under applied loading using LEFM principles						
Syllabus:							
Module	Contents						Lecture Hours
I	Review of Fundamental Concepts: Stress and strain tensors, Equilibrium equations and compatibility conditions, Constitutive relationships for linear elasticity						8
II	Theory of Elasticity: Two-dimensional and three-dimensional elasticity problems, Airy stress function and solution techniques, Torsion of non-circular cross-sections (Prandtl's membrane analogy), Bending of beams and plates						8
III	Energy Methods in Solid Mechanics: Principle of virtual work, Castigliano's theorems, Minimum potential energy principle, Rayleigh-Ritz method						8
IV	Plasticity and Yield Criteria: Introduction to plasticity, Yield criteria (von Mises, Tresca, and Mohr-Coulomb), Plastic stress-strain relationships, Applications to metal forming and structural analysis						7
V	Fracture Mechanics: Stress concentration and Griffith's theory, Linear Elastic Fracture Mechanics (LEFM), Stress intensity factors and energy release rate, Crack propagation and fatigue analysis						7
VI	Advanced Topics in Stress Analysis: Thermal stresses and thermo elasticity, Anisotropic materials and composite structures						7
Total Lecture Hours						45	
List of Experiments with CO Mapping							
Sr. No.	Title of Lab Work						CO Mapped
1	Stress & Strain Measurement using Strain Gauges						1
2	Verification of Elastic Constants (Young's Modulus & Poisson's Ratio)						1


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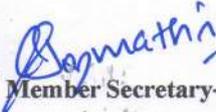

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3	Photoelasticity for Stress Concentration Analysis	2
4	Torsion of Non-Circular Shafts (Prandtl's Analogy)	2
5	Bending of Beams (Deflection & Stress Distribution)	2
6	Energy Methods: Castigliano's Theorem Validation	3
7	Yield Criteria Verification (von Mises & Tresca)	4
8	Fracture Mechanics – Stress Intensity Factor (SIF) Determination	5
9	Fatigue Test on Steel Specimen	5
10	Thermal Stress Analysis (Experimental or Numerical)	2, 3
Total Practical Sessions		15
Total Practical Hours		30
Text Books:		
1. A. P. Boresi & R. J. Schmidt, Advanced Mechanics of Materials, 6th Edition, Wiley Publications, 2012.		
2. S. P. Timoshenko & J. N. Goodier, Theory of Elasticity, 3rd Edition, McGraw-Hill Education, 2014.		
3. W. F. Chen & D. J. Han, Plasticity for Structural Engineers, 3rd Edition, J. Ross Publishing, 2013.		
4. W. F. Chen & Salah El-Din E. El-Metwally, Understanding Structural Engineering, 1st Edition, CRC Press, 2019.		
References:		
1. B. C. Punmia & A. K. Jain, Comprehensive R.C.C. Designs, 5 th Edition, Laxmi Pub., 2015.		
2. R. S. Lakes, Viscoelastic Solids, 1st Edition, CRC Press Revivals, 2017.		
3. Klaus-Jürgen Bathe, Finite Element Procedures, 2nd Edition, 2014.		
Online Learning Resources:		
1. For Advanced Solid Mechanics – NPTEL lecture notes: https://archive.nptel.ac.in/content/storage2/courses/105106049/lecnotes/main.html		
2. For Advanced Solid Mechanics – NPTEL Syllabus PDF: https://archive.nptel.ac.in/content/syllabus_pdf/105106049.pdf		
3. For Advanced Solid Mechanics – NPTEL video lectures & materials via NPTEL https://www.nptelprep.in/courses/105106049/materials		
4. For Solid Mechanics (UG level, foundational) – NPTEL on Swayam by Prof. Ajeet Kumar: https://onlinecourses.nptel.ac.in/noc21_me117/preview		


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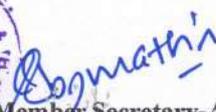

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 Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist.: Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Civil Engineering							
Course Information:							
Class, Semester	F. Y.M. Tech, Semester – I		Category	PE			
Course Code, Course Title	0SEPE506, Dynamics of Structures		Type	LIT2			
Prerequisites	-----						
Teaching Scheme (per week)	Lecture	Tutorial	Practical	Self-Study	Credits		
	3	1	2	2	5		
Examination Scheme (Marks)	Theory	MSE	TA	ESE	Practical	CIA	ESE
		40	20	40		50	--
Course Outcomes (COs):							
Upon successful completion of this course, the student will be able to:							
CO1	Understand the fundamental concepts of structural dynamics and derive governing equations for various dynamic systems.						
CO2	Analyze the response of single-degree-of-freedom (SDOF) systems under free, forced, and damped vibrations including transient and harmonic loading.						
CO3	Evaluate the dynamic behavior of multi-degree-of-freedom (MDOF) systems using analytical and approximate methods.						
CO4	Apply numerical techniques such as time integration and modal analysis to solve dynamic problems.						
CO5	Assess the seismic performance of structures and apply principles of earthquake-resistant design.						
CO6	Demonstrate the use of vibration control techniques and recognize advanced topics such as blast/impact loading.						
Syllabus:							
Module	Contents			Lecture Hours			
I	Introduction to Structural Dynamics: Introduction to dynamics and comparison with statics, Types of dynamic loading: harmonic, periodic, transient, random, Idealization of structures for dynamic analysis, Formulation of equation of motion: D'Alembert's principle, Newton's laws, Free vibration of SDOF systems without damping, Natural frequency and mode shapes.			8			
II	Damped and Forced Vibration of SDOF Systems: Damping: types and mathematical modelling, Response of damped SDOF systems (under-damped, critically damped, over-damped), Forced vibration: harmonic excitation with and without damping, Resonance, dynamic amplification factor, Response to general dynamic loading: Duhamel's integral, Response spectrum and its application.			7			
III	Multi-Degree-of-Freedom (MDOF) Systems: Equations of motion for MDOF systems, Free vibration analysis: natural frequencies and mode shapes, Orthogonality of modes, Modal analysis and modal superposition method, Rayleigh's method and Dunkerley's method for approximate solutions, Lumped vs distributed parameter systems.			8			
IV	Numerical Methods in Structural Dynamics: Time integration methods- Newmark-beta method & Wilson- θ method, Stability and accuracy of numerical methods, Direct integration vs modal superposition, Application of finite element method in structural dynamics, Computer-aided dynamic analysis (Introduction to software tools).			8			
V	Earthquake Engineering and Seismic Response: Characteristics of earthquake ground motion, Design ground motion and response spectra, Seismic analysis of structures using equivalent static method, Response of SDOF and MDOF systems to earthquake loading, Performance-based seismic design concepts.			7			


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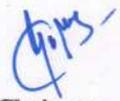

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VI	Vibration Control and Special Topics:		7
	Vibration isolation and absorption techniques, Base isolation and energy dissipation devices, Tuned mass dampers (TMDs), base isolators, Active and passive control systems, Blast and impact loading: introduction and response analysis.		
Total Lecture Hours			45
Laboratory Work with CO Mapping:			
Sr. No.	Title of Lab Work	CO Mapped	
1	Determine natural frequency of a spring-mass or pendulum model.	1	
2	Determine natural frequencies and mode shapes of a cantilever/simply supported beam using experimental modal analysis.	1	
3	Determine damping ratio for under-damped vibration.	2	
4	Study amplitude vs frequency response, identify resonance and dynamic amplification factor.	2	
5	Determine natural frequencies and mode shapes of a 2-DOF frame.	3	
6	Use MATLAB/ANSYS/ETABS to compute mode shapes and natural frequencies.	3	
7	Compute displacement and velocity response of an SDOF system under dynamic loading using MATLAB/Excel.	4	
8	Apply FEM (ANSYS/ETABS/SAP2000) for structural dynamic response analysis of a beam or frame.	4	
9	Study seismic response of a scaled frame model subjected to simulated earthquake ground motion.	5	
10	Demonstrate vibration reduction in a structure with and without a tuned mass damper under harmonic excitation.	6	
Total Practical Sessions		15	Total Tutorial Hours
			30
Text Books			
1. Chopra, A. K. Dynamics of Structures: Theory and Applications to Earthquake Engineering, Pearson Education, 5th Edition, 2020.			
2. Craig, R. R., and Kurdila, A. J. Fundamentals of Structural Dynamics. John Wiley & Sons, 2nd Edition, 2006.			
3. Estrada, H., and Lee, L. S. Essentials of Structural Dynamics. McGraw-Hill Education, 1st Edition, 2022.			
4. Paz, M., and Leigh, W. Structural Dynamics: Theory and Computation. Springer, 6th Edition, 2020.			
5. Kausel, E. Advanced Structural Dynamics. Cambridge University Press, 1st Edition, 2017.			
References:			
1. Clough, R. W., and Penzien, J. Dynamics of Structures. McGraw-Hill, 2nd Edition, 1993.			
2. Biggs, J. M. Introduction to Structural Dynamics. McGraw-Hill, 1st Edition, 1964.			
3. Zingoni, A. Vibration Analysis and Structural Dynamics for Civil Engineers. CRC Press (Taylor & Francis up), 1st Edition, 2015.			
4. Petrosian, L. G. Dynamics of Structures. Springer, 1st Edition, 2024.			
5. Humar, J. L. Dynamics of Structures. CRC Press (Taylor & Francis Group), 3rd Edition, 2012.			
Online Learning Resources:			
1. https://www.youtube.com/playlist?list=PL0zRYVm0a65c37kZw_PNHPkmMOY0zzezqf			
2. https://www.youtube.com/playlist?list=PLq-HWmcr8q8QExIcv_LZq3tY-p1blupj8			
3. https://www.youtube.com/playlist?list=PLp6ek2hDcoNCW8SLOe4teq5MOC-zswNI2			
4. https://www.youtube.com/playlist?list=PLq-HWmcr8q8RaUIDkUj85hHkCgAGC7P9S			


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Department of Civil Engineering

**Course Information:**

Class, Semester	F.Y.M. Tech, Semester – I			Category	PE
Course Code, Course Title	0SEPE507, Design of Bridges			Type	LIT2
Prerequisites	-----				
Teaching Scheme (per week)	Lecture	Tutorial	Practical	Self-Study	Credits
	3	1	2	2	5
Examination Scheme (Marks)	Theory	MSE	TA	ESE	Practical
		40	20	40	CIA
					50
					ESE
					--

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

CO1	Analyze the classification and behavior of bridges under various loading conditions using IS and IRC codes to ensure compliance with structural safety.
CO2	Design reinforced concrete bridges considering material properties, structural stability, and serviceability using IS:456 and IRC:112.
CO3	Evaluate steel and composite bridge structures for strength and durability by applying relevant standards such as IRC:24 and IRC:22.
CO4	Apply prestressed concrete bridge design techniques using loss calculations and detailing as per IRC:18 to enhance structural performance.
CO5	Assess the stability of bridge substructures and bearing systems under hydraulic and seismic forces to ensure durability and functionality.
CO6	Develop innovative bridge construction and maintenance strategies incorporating modern technologies like FRP strengthening and smart monitoring systems.

Syllabus:

Module	Contents	Lecture Hours
I	Introduction to Bridge Engineering Historical development of bridges, classification, and essential components. Site investigation and selection criteria for bridge locations. Influence of various loads on bridges, including live loads, dead loads, impact factors, and distribution theories, as per the latest IS and IRC standards.	7
II	Design of RCC Bridges Analysis and design of reinforced concrete bridges, including slab bridges, T-beam bridges, and box culverts. Application of relevant IS and IRC codes such as IRC:112 and IS:456. Load considerations, detailing, and durability aspects of RCC bridges.	7
III	Design of Steel and Composite Bridges Design principles of steel bridges, including plate girder and truss bridges. Concept of steel-concrete composite bridges, their advantages, and structural behavior. Design considerations, connections, and construction practices in accordance with IRC:24 and IRC:22.	8
IV	Prestressed Concrete Bridges Principles and advantages of prestressed concrete bridges. Design aspects of prestressed girders, loss calculations, and provisions of IRC:18. Case studies of modern prestressed concrete bridges.	8
V	Substructures and Bearings Various substructure components such as piers, abutments, and wing walls. Design principles of well and pile foundations. Different types of bearings, expansion joints, and their detailing with reference to IRC:83. Impact of hydraulic and seismic forces on substructure design.	8
VI	Construction, Maintenance, and Modern Trends in Bridges Construction methodologies for different bridge types, including modern erection techniques. Bridge maintenance, inspection practices, rehabilitation, and strengthening techniques. Advancements such as FRP applications, smart monitoring systems, and the design of cable-stayed and suspension bridges.	7
Total Lecture Hours		45

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List of Experiments with CO Mapping:			
Sr. No.	Title of Lab Work		CO Mapped
1	Load testing of a small-scale truss bridge.		1
2	Analysis of a reinforced concrete bridge using ETABS/STAAD Pro.		2
3	Design of a steel plate girder bridge model.		3
4	Wind tunnel test for aerodynamic stability of a cable-stayed bridge model.		1
5	Non-destructive testing (NDT) of a bridge deck using ultrasonic pulse velocity.		6
6	Structural health monitoring (SHM) using fiber optic sensors.		6
7	Fatigue analysis of a steel bridge member.		3
8	Proof load test & load rating of a small-scale bridge model.		1
9	Compression and shear behaviour test of elastomeric bearing pads.		5
10	Strengthening of an RC bridge slab using externally bonded FRP strips.		6
Total Practical Sessions		15	Total Practical Hours
			30
Text Books			
1. S.P. Bindra, Bridge Engineering, 6th Edition, Dhanpat Rai, 2012.			
2. D. Johnson Victor, Essentials of Bridge Engineering, 6th Edition, PHI Learning, 2017.			
3. Aswini Kumar, Design of Concrete Bridges, 2nd Edition, CRC Press, 2015.			
4. V.K. Raina, Concrete Bridge Design, 2nd Edition, Tata McGraw-Hill, 2019.			
References:			
1. W.F. Chen and Lian Duan, Structural Bridge Engineering, 1st Edition, CRC Press, 2003.			
2. Gongkang Fu, Bridge Design and Evaluation, 1st Edition, Wiley, 2013.			
3. N. Rajagopalan, Prestressed Concrete Bridges, 2nd Edition, Narosa Publishing, 2005.			
4. James K. Wight, Modern Prestressed Concrete, 8th Edition, Pearson, 2021.			
5. M.S. Troitsky, Design of Steel Bridges, 1st Edition, CRC Press, 2017.			
Codes:			
1. IRC:6-2017, Standard Specifications for Road Bridges.			
2. IRC:112-2020, Code of Practice for Concrete Road Bridges.			
3. IRC:18-2017, Design of Prestressed Concrete Road Bridges.			
4. IRC:24-2010, Steel Road Bridges.			
5. IS:456-2000, Code of Practice for Plain and Reinforced Concrete.			
6. IS:1343-2012, Code of Practice for Prestressed Concrete.			
7. IRC:83-2019, Bearings for Bridges.			
Online Learning Resources:			
1. Prof. Nirjhar Dhang, Reinforced Concrete Road Bridges, NPTEL Course, IIT Kharagpur https://archive.nptel.ac.in/noc/courses/noc17/SEM2/noc17-ce24 .			
2. NPTEL, Bridge Engineering, NPTEL Course https://nptel.ac.in/courses/105105216 .			

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Course Information:							
Class, Semester		F.Y.M. Tech, Semester – I				Category	MA
Course Code, Course Title		0SEMA508, English for Research Paper Writing				Type	T2
Prerequisites		-----					
Teaching Scheme (per week)		Lecture	Tutorial	Practical	Self-Study	Credits	
		2	--	--	--	--	
Examination Scheme (Marks)		Theory	MSE	TA	ESE	Practical	CIA
			--	50	--		ESE
						--	--
Course Outcomes (COs):							
Upon successful completion of this course, the student will be able to:							
CO1	Apply the guidelines to revise and edit their own academic writing for clarity, precision, and formal tone						
CO2	Identify formatting guidelines to restructure a manuscript for academic purposes by using word processing software.						
CO3	Examine the potential benefits and limitations of AI in research writing, by focusing on accuracy and ethical considerations.						
CO4	Analyze the abstract to identify the research question, methodology, and key findings with the help of several web tools.						
Syllabus:							
Module	Contents						Lecture Hours
I	Foundations of Academic English in Research: Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness. Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.						8
II	Advanced Reading & Vocabulary Skills for Researchers: Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.						7
III	Mastery In Revising, Editing, and Proofreading: Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.						8
IV	Technology And Language for Research: Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions, Useful phrases, how to ensure paper is as good as it could possibly be the first-time submission.						7
Total Lecture Hours						30	
Text Books							
1. Swales, J. & C. Feak, Academic Writing for Graduate Students, Michigan University Press, 2012							
2. Phyllis Crème, Writing at University: A Guide for Students, 3 rd Edition, Open Univ Press, 2016							
3. Stephen Bailey, Academic Writing A Handbook for International Students, 2nd Edition, Taylor & Francis Group, 2011							
4. Gail Craswell, Writing for Academic Success: A Postgraduate Guide, 1st Edition, Sage Publications Ltd., 2013							
5. Oshima, A. & Hogue, A., Writing Academic English, 3rd Edition, Wesley, New York, 2014							
References:							
1. Adrian Wallwork, English for Writing Research Papers, 3rd Edition, Springer, 2023							
2. Wendy Laura Belcher, Writing Your Journal Article in 12 Weeks: A Guide to Academic Publishing Success, 2 nd Edition, SAGE Publications, 2019							

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| 3. Paul J. Silvia, How to Write a Lot: A Practical Guide to Productive Academic Writing, American Psychological Association, 2 nd Edition, 2018 |
| 4. Adrian Wallwork, English for Academic Research: Grammar, Usage and Style, 2 nd Edition, Springer, 2015 |

Online Learning Resources:

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| 1. NPTEL Course on English for Research Paper Writing, by Dr. Shoba. K. N., NITTTR, Chennai
https://onlinecourses.swayam2.ac.in/ntr25_ed81/preview |
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Course Information:							
Class, Semester	F. Y. M. Tech, Semester – II		Category	OE			
Course Code, Course Title	0SEOES09, Optimization Techniques		Type	T1			
Teaching Scheme (per week)	Lecture	Tutorial	Practical	Self-Study	Credits		
	3	-	-	-	3		
Examination Scheme (Marks)	Theory	MSE	TA	ESE	Practical	CIA	ESE
		40	20	40		-	-
Course Outcomes (COs): Upon successful completion of this course, the student will be able to:							
CO1	Apply optimization and meta-heuristic techniques (GA, PSO, etc.) to engineering optimization problems.						
CO2	Analyze the structure and learning of Artificial Neural Networks using perceptron's and backpropagation.						
CO3	Apply fuzzy logic methods for modeling, reasoning, and control in engineering systems.						
CO4	Evaluate the performance of Genetic Algorithms, Neural Networks, and Fuzzy Systems against conventional methods.						
CO5	Analyze hybrid approaches such as Neuro-fuzzy and ANFIS for system optimization.						
CO6	Create domain-specific AI-based soft computing solutions to complex engineering problems.						
Syllabus:							
Module	Contents						Lecture Hours
I	Fundamentals Of Soft Computing Techniques Definition-Classification of optimization problems - Unconstrained and Constrained optimization - Optimality conditions - Introduction to intelligent systems - soft computing techniques – Conventional Computing versus Swarm Computing - Classification of meta-heuristic techniques - Single solution based and population-based algorithms – Exploitation and exploration in population-based algorithms - Properties of Swarm intelligent Systems						8
II	Artificial Neural Networks Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron. Learning and training the neural network. Multi – layer perceptron using Back propagation Algorithm (BPA)						8
III	Fuzzy Logic Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control (Mamdani and Sugeno) – Fuzzification, inferencing and defuzzification-Fuzzy knowledge and rule bases-Applications						7
IV	Genetic Algorithms Basic concept of Genetic algorithms - Genetic Algorithm versus Conventional Optimization Techniques – Genetic representations and selection mechanisms; Genetic operators - different types of crossover and mutation operators- Optimization problems using GA.						7
V	Hybrid Control Schemes Fuzzification and rule base using ANN–Neuro fuzzy systems-ANFIS – Fuzzy Neuron -Optimization of membership function and rule base using Genetic Algorithm – Particle Swarm Optimization						8
VI	Applications of Soft Computing Civil: Resource Optimization in Construction, Structural Health Monitoring (SHM), Smart Urban Infrastructure, Dynamic Response of Structures, Soil Stability Monitoring						7
Total Lecture Hours						45	
Text Books							
1. Laurene V. Fausett, Fundamentals of Neural Networks: Architectures, Algorithms and Applications, 1st Edition, Pearson Education, 1993.							
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd Edition, Wiley India, 2010.							


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3. H. J. Zimmermann, Fuzzy Set Theory and Its Applications, 4th Edition, Springer International, 2001.
4. David E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, 1st Edition, Pearson Education, 1989.
5. S. N. Sivanandram & S. N. Deepa, Principles of Soft Computing, 3rd Edition, Wiley India, 2018.
References:
1. S. Rajasekaran & G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications, 1st Edition, PHI Learning Pvt. Ltd., 2003.
2. Robert J. Schalkoff, Artificial Neural Networks, 1st Edition, Tata McGraw Hill, 1997.
3. N. P. Padhy, Artificial Intelligence and Intelligent Systems, 1st Edition, Oxford University Press, 2005.
4. D. P. Kothari & J. S. Dhillon, Power System Optimization, 2nd Edition, PHI Learning Pvt. Ltd., 2010.
Online Learning Resources
1. Deep Learning Specialization by Andrew Ng (Coursera) https://www.coursera.org/specializations/deep-learning
2. Fuzzy Sets, Logic and Systems & Applications (NPTEL) https://onlinecourses.nptel.ac.in/noc22_ee21/preview
3. Genetic Algorithms (NPTEL) https://nptel.ac.in/courses/112105235
4. Soft Computing Techniques (NPTEL) https://onlinecourses.nptel.ac.in/noc25_ma54/preview
5. Machine Learning Specialization (Coursera) https://www.coursera.org/specializations/machine-learning



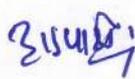
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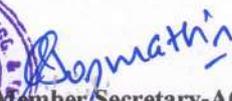
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 Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist.: Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Civil Engineering							
Course Information:							
Class, Semester	F. Y. M. Tech, Semester – II		Category	PC			
Course Code, Course Title	0SEPC510, Finite Element Method		Type	LIT2			
Prerequisites	-----						
Teaching Scheme (per week)	Lecture	Tutorial	Practical	Self-Study	Credits		
	3	--	2	2	4		
Examination Scheme (Marks)	Theory	MSE	TA	ESE	Practical	CIA	ESE
		40	20	40		50	--
Course Outcomes (COs):							
Upon successful completion of this course, the student will be able to:							
CO1	Explain FEM fundamentals, discretization, shape functions, and energy principles.						
CO2	Formulate stiffness matrices and nodal load vectors for 1D structural elements (bars, beams, frames).						
CO3	Apply 2D finite element techniques for plane stress/strain problems using triangular and quadrilateral elements.						
CO4	Develop FEM formulations for 3D continuum and axisymmetric elements.						
CO5	Construct isoparametric, plate, and shell elements, and apply numerical integration schemes.						
CO6	Apply FEM to structural dynamics problems, including eigenvalue and eigenvector analysis.						
Syllabus:							
Module	Contents						Lecture Hours
I	Introduction to Finite Element Method: Basic concept of finite element analysis, Discretization, nodes, element incidences, displacement model, shape function, selection of order of polynomials, application to bars with constant and variable cross sections subjected to axial forces. Principle of minimum potential energy, variation principle, reviews of elasticity, stress-strain relations, and strain-displacement relations.						8
II	1D Finite Element Analysis: Development of element stiffness matrix and nodal load vector for truss, beam and plane frame elements, Transformation of matrices, relevant structural engineering applications.						7
III	2D Finite Element Analysis: Triangular and quadrilateral shape elements for plane stress and plane strain problems. Pascal's triangle, convergence requirements and compatibility conditions, shape functions, boundary conditions, element aspect ratio, applications to a continuum.						8
IV	3D Finite Element Analysis: Development of element stiffness matrix and nodal load vector for Tetrahedron, Hexahedral elements, Axisymmetric Elements - Development of element stiffness matrix and nodal load vector.						7
V	Isoperimetric Elements: Isoperimetric elements Shape function, Natural coordinate systems, classification of isoperimetric-sub-parametric, super parametric elements, 1-D & 2-D isoperimetric elements, Gauss-quadrature integration. Plate and Shell Elements Plate and Shell Elements Formation of stiffness matrix for plate bending elements of triangular and quadrilateral shapes, cylindrical thin shell elements.						8
VI	FEM Applications to Structural Dynamics Finite Element Applications to Structural Dynamics Formulation, Hamilton's principle, element mass matrices, evaluation of Eigen values and eigenvectors.						7
Total Lecture Hours						45	


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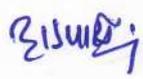

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Laboratory Work with CO Mapping:			
Sr. No.	Title of Lab Work		CO Mapped
1	Analyze the stress-strain behavior of a 1D bar element using FEM and compare it with analytical results		1
2	Determine deflection and bending stresses in a beam using FEM		2
3	Analyze a 2D plate subjected to in-plane loading using FEM		3
4	Perform FEM-based analysis of trusses and frames under different loading conditions.		3
5	Implement isoperimetric elements and apply numerical integration techniques in FEM.		4
6	Implement higher-order elements for structural analysis and understand 3D FEM formulations.		5
7	Perform modal analysis and time-history analysis of structures using FEM.		6
8	Study the effects of geometric and material nonlinearity using FEM.		6
9	Model and Analyze axisymmetric elements under different load condition.		4
10	Formulate and Analyze plate bending elements. (Triangular / Quadrilateral plates)		5
Total Practical Sessions		15	Total Tutorial Hours
			30
Text Books			
1. Bathe, K. J., Finite Element Procedures, Prentice Hall, 1996.			
2. Zienkiewicz, O. C., Taylor, R. L., & Zhu, J. Z., The Finite Element Method: Its Basis and Fundamentals, 7th Edition, Butterworth-Heinemann, 2013.			
3. Logan, D. L., A First Course in the Finite Element Method, 6th Edition, Cengage Learning, 2016.			
4. Reddy, J. N., An Introduction to the Finite Element Method, 3rd Edition, McGraw-Hill, 2006.			
5. Hughes, T. J. R., The Finite Element Method: Linear Static and Dynamic Finite Element Analysis, Dover Publications, 2000.			
6. Brenner, S. C., & Scott, L. R., The Mathematical Theory of Finite Element Methods, 3rd Edition, Springer, 2007.			
References:			
1. Gockenbach, M. S., Understanding and Implementing the Finite Element Method, SIAM, 2006.			
2. Madier, D., Practical Finite Element Analysis for Mechanical Engineers, Create space Independent Publishing, 2011.			
3. Cook, R. D., Malkus, D. S., Plesha, M. E., & Witt, R. J., Concepts and Applications of Finite Element Analysis, 4th Edition, Wiley, 2001.			
4. Khennane, A., Introduction to Finite Element Analysis Using MATLAB and Abaqus, CRC Press, 2013.			
5. Smith, I. M., Griffiths, D. V., & Margetts, L., Programming the Finite Element Method, 5th Edition, Wiley, 2014.			
6. Belytschko, T., Liu, W. K., & Moran, B., Nonlinear Finite Elements for Continua and Structures, Wiley, 2000.			
7. Braess, D., Finite Elements: Theory, Fast Solvers, and Applications in Solid Mechanics, 3rd Edition, Cambridge University Press, 2007.			
8. Süli, E., Finite Element Methods for Partial Differential Equations, Oxford University Press, 2003.			
Online Learning Resources:			
1. MIT Open Course Ware: Finite Element Procedures for Solids and Structures by Prof. K. J. Bathe – YouTube Playlist			
2. Introduction to the Finite Element Method (Lecture Series) – YouTube Playlist			
3. Understanding the Finite Element Method – YouTube Video			
4. Introduction to Finite Element Analysis (Full Lecture, 1 Hour) – YouTube Video			
5. Introduction to the Finite Element Method (with ANSYS) – YouTube Playlist			


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Annasaheb Dange College of Engineering and Technology
Ashta - 416301, Dist.:Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Civil Engineering

**Course Information:**

Class, Semester	F. Y. M. Tech, Semester – II				Category	PC	
Course Code, Course Title	0SEPC511, Advanced Design of Steel Structures				Type	LIT1	
Prerequisites	-----						
Teaching Scheme (per week)	Lecture	Tutorial	Practical	Self-Study	Credits		
	3	1	2	2	5		
Examination Scheme (Marks)	Theory	MSE	TA	ESE	Practical	CIA	ESE
		40	20	40		50	50

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

CO1	Understand the fundamental concepts of multistory steel buildings, including load transfer mechanisms and lateral load-resisting systems.
CO2	Analyze and design various types of steel bridges, including trussed girder bridges, deck-type, and through-type bridges, considering loading conditions and bearing types
CO3	Apply code provisions for cold-formed light gauge steel sections and design compression elements.
CO4	Perform plastic analysis of steel structures, including plastic bending, yield criteria, and plastic moment distribution methods.
CO5	Evaluate concrete-steel composite sections, including shear connectors, composite beams, and encased steel columns, based on IS recommendations.

Syllabus:

Module	Contents	Lecture Hours
I	Multistory steel buildings: Introduction, load transfer mechanism, lateral load resisting systems and analysis, Design of moment resistant frames, concentrically braced frames, connections in multistory buildings, interacting moment resisting frames with shear walls for seismic/ wind effects structural systems, framed tube structures, braced tube structures, tube in tube structures.	7
II	Design of Steel bridges: Types, Loads, Trussed girder bridge design, bearings and it's types. Deck type and through type bridges.	7
III	Cold-formed light gauge steel sections: Code provisions, Design considerations for compression elements, design of compression elements, stiffened compression elements, multi stiffened elements, and design of light gauge beams.	8
IV	Plastic analysis: Plastic bending of beams, plastic hinge, upper and lower bond theorems, uniqueness theorem, yield criteria, analysis and design of fixed and continuous beams.	8
V	Design of portal frames & Pre-engineered Buildings: Plastic Analysis: Collapse mechanisms, analysis and design of gables, multistory-multi bay frames, check for stability of frames, plastic moment distribution method. Introduction to Pre-engineered Buildings.	8
VI	Concrete-Steel composite sections: I.S. Recommendations, Shear connectors, types and characteristics, Design requirements of Shear connectors, Design of composite beams, Design of encased steel columns.	7
Total Lecture Hours		45

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List of Practical with CO Mapping:			
Sr. No.	Title of Lab Work		CO Mapped
1	Load Transfer in Multistory Steel Buildings – Software-based analysis of a multi-story steel frame (STAAD Pro, ETABS, SAP2000).		1
2	Steel Bridge Design – Hands-on design of a trussed girder bridge using IS codes and software.		1
3	Experimental Testing of Cold-formed Steel Sections – Compression test on cold-formed light gauge steel sections.		2
4	Plastic Analysis of Beams and Frames – Experimental verification of plastic hinge formation in steel beams.		2
5	Portal Frame Analysis – Software-based plastic analysis and stability check of a portal frame.		3
6	Composite Beam Testing – Experimental study of shear connectors and load transfer in composite beams.		3
7	Lateral Load Analysis in Steel Buildings – Modeling and checking drift under wind/earthquake using ETABS.		3
8	Deck-type vs. Through-type Bridge Comparison – Structural modeling and performance study in software.		5
9	Light Gauge Steel Flexural Test – Bending test on C and Z sections to study behavior.		4
10	Plastic Collapse Load Estimation – Use of upper and lower bound theorems in sample steel frames.		4
11	Design of Pre-Engineered Buildings (PEB) – Case study and software modeling of an industrial shed.		4
12	Buckling Study of Columns – Experimental and numerical study of slender vs. stub steel columns.		4
13	Shear Connector Push-out Test – Lab test to study behavior of welded shear studs.		5
14	Encased Steel Column Testing – Experimental demonstration of composite columns under axial load.		5
15	Case Study on Real Steel Structure – Field/virtual visit, documentation, and load path identification in an actual steel building or bridge.		5
Total Practical Sessions		15	Total Tutorial Hours
			30
Text Books			
1. Dr. N. Subramanian, Design of Steel Structures, 2nd Edition, Oxford University Press, New Delhi, 2016.			
2. A. S. Arya and A. Kumar, Design of Steel Structures, 1st Edition, New Chand and Bros., Roorkee, 2017.			
3. Dr. M. R. Shiyekar, Limit State Design of Steel Structures, 2nd Edition, PHI Learning, 2013.			
4. Dr. Ramchandra, Design of Steel Structures – Vol. II, 1st Edition, Standard Book House, Delhi, 2014.			
References:			
1. A. S. Arya and J. L. Ajamani, Design of Steel Structures, 3rd Edition, Nem Chand and Brothers, 2010.			
2. B. S. Taranath, Structural Analysis and Design of Tall Buildings, 2nd Edition, McGraw Hill, 2017.			
3. INSDAG, Guide for the Structural Use of Steelwork in Buildings, 1st Edition, INSDAG, 2014.			
4. A. S. Arya and J. L. Ajamani, Design of Steel Structures, 3rd Edition, Nem Chand and Brothers, 2010.			
Online Learning Resources			
1. NPTEL Course on Design of Steel Structures, Prof. Damodar Maity, IIT Kharagpur https://nptel.ac.in/courses/105105167			
2. NPTEL Course on Advanced Structural Analysis, Prof. Devdas Menon, IIT Madras https://nptel.ac.in/courses/105106145			
3. NPTEL Course on Structural Dynamics, Prof. Sudhir K. Jain, IIT Kanpur https://nptel.ac.in/courses/105104157			
4. NPTEL Course on Stability and Analysis of Structures, Prof. B. Bhattacharjee, IIT Delhi https://nptel.ac.in/courses/105102088			


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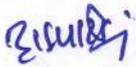

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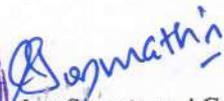

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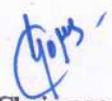
		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist.: Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Civil Engineering					
Course Information:							
Class, Semester	F.Y.M. Tech, Semester – II					Category	PE
Course Code, Course Title	0SEPE512, Advanced Design of Foundation					Type	LIT1
Prerequisites	-----						
Teaching Scheme (per week)	Lecture	Tutorial	Practical	Self-Study	Credits		
	3	-	2	2	4		
Examination Scheme (Marks)	Theory	MSE	TA	ESE	Practical	CIA	ESE
		40	20	40		50	50
Course Outcomes (COs):							
Upon successful completion of this course, the student will be able to:							
CO1	Evaluate the bearing capacity of soil under various loading and soil conditions using classical and modern theories						
CO2	Design shallow foundations under varying loading and soil conditions, ensuring safe settlement performance by evaluating elastic, consolidation, and differential settlements using field test data.						
CO3	Determine raft foundations for buildings and tower structures, considering soil-structure interaction and load distribution, ensuring stability, serviceability, and optimal performance under varying soil and loading conditions.						
CO4	Design deep foundations under vertical and lateral loads, considering installation methods, load capacity, negative skin friction, for the performance in heavy structures.						
CO5	Analyze machine foundations, well foundations, and cofferdams considering vibration behavior, stability, bearing capacity, and settlement criteria for safe and efficient performance.						
Syllabus:							
Module	Contents						Lecture Hours
I	Bearing capacity of Soil: Bearing capacity theories (Terzaghi's, Meyerhoff's, Hansen's, Vesic's, Balla's)- foundations subjected to centric vertical loads, inclined loads, eccentric loads, foundations on layered soils, anisotropic soils, foundations on slopes, over voids, interference of footings.						7
II	Shallow Foundation: - Settlement Analysis- components of settlement, elastic settlement, flexible and rigid footings, contact pressure distribution, prediction of elastic parameters from SPT, CPT and other field tests, consolidation settlement, differential settlement. Design of individual footings, strip footing, combined footing, rigid and flexible mat, buoyancy raft, basement raft, underpinning.						7
III	Raft foundations: Raft foundations for building and tower structures, including effects of soil-structure interaction and nonlinearity, Different types, Design considerations and various methods of analysis and design of raft foundation.						8
IV	Deep foundations: Pile foundation-types, methods of installation, Codal practices for permissible load under vertical and lateral loads, stresses during pile driving, load carrying capacity of pile groups, negative skin friction, under-reamed piles, Foundation for heavy structures, well foundations, caisson foundations, equipment used for construction of these foundation systems.						8
V	Machine foundations: Theory of vibrations, free and forced vibrations with and without damping for a single degree freedom system, types of machine foundations, their design criteria, permissible amplitudes and bearing pressure.						8
VI	Well Foundations: Types, components, construction methods, design methods (Terzaghi, IS and IRC approaches), check for stability, base pressure, side pressure and deflection. Cofferdams: Stability, bearing capacity, settlements (qualitative treatment only).						7
Total Lecture Hours						45	


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List of Experiments with CO Mapping:			
Sr. No.	Title of Lab Work		CO Mapped
1	Particle Size Distribution of soil by Dry Mechanical Sieve Analysis.		1
2	Determination of Coefficient of Permeability by Constant Head Method.		1
3	Determination of Coefficient of Permeability by Variable Head Method.		1
4	Determination of Compaction Characteristics of soil by Standard Proctor Test.		2
5	Determination of Shear Strength Parameters (C- ϕ) of soil by Direct Shear Test.		2,4
6	Determination of Standard Penetration Test (SPT) value of soil.		2
7	Determination of California Bearing Ratio (CBR) value of soil sample.		2
8	Determination of Shear Strength Parameters of soil by Tri-axial Shear Test.		4
9	Determination of Ultimate Bearing Capacity of soil by Plate Load Test.		1,2
10	Determination of Dynamic Soil Properties by Free and Forced Vibration Test.		5
Total Practical Sessions		15	Total Practical Hours
			30
Text Books:			
1. Bowles J.E., Foundation Analysis & Design, 5th Edition, McGraw Hill Book, 2017.			
2. Goodman L.J. and Karol R.H., Theory & Practice of Foundation Engineering, 2nd Edition, McMillan, 2023.			
3. D.D. Barkar, Dynamics of Bases & Foundation, 3rd Edition, -, 2021.			
4. Winterkorn H.F. and Fang H.Y., Foundation Engineering Handbook, 5th Edition, Van Nostrand Reinhold, 2022.			
References:			
1. Kany M., Design of Raft Foundation, 5th Edition, -, 2019.			
2. Shamsher, Soil Dynamics, 2nd Edition, McGraw Hill, 2021.			
Codes:			
1. IS:6403-1981 – Code of practice for determination of bearing capacity of shallow foundations.			
2. IS:8009 (Part 1)-1976 – Code of practice for calculation of settlements of foundations – Shallow foundations subjected to symmetrical static vertical loads.			
3. IS:8009 (Part 2)-1980 – Code of practice for calculation of settlements of foundations – Raft foundations subjected to static vertical loads.			
4. IS:2911 (Part 1 to 4)-2010 – Design and construction of pile foundations (various types: driven cast in-situ, bored cast in-situ, precast, under-reamed piles).			
5. IS:2950 (Part 1 & 2)-1981 – Code of practice for design and construction of raft foundations.			
6. IS:2974 (Part 1 to 5)-1982/1987 – Code of practice for design and construction of machine foundations.			
Online Learning Resources:			
1. NPTEL Online Certification, Foundation Engineering https://nptel.ac.in/courses/105101084			
2. NPTEL Online Certification, Soil Dynamics and Machine Foundations https://nptel.ac.in/courses/105101010			
3. NPTEL Online Certification, Advanced Foundation Engineering https://nptel.ac.in/courses/105101166			
4. MIT Open Course Ware, Soil Behavior and Geotechnical Design https://ocw.mit.edu			
5. Coursera, Geotechnical Engineering Fundamentals https://www.coursera.org			



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Course Information:				
Class, Semester	F.Y.M. Tech, Semester – I		Category	PE
Course Code, Course Title	0SEPE513, Computer Aided Analysis & Design		Type	LIT1
Prerequisites	-----			
Teaching Scheme (per week)	Lecture	Tutorial	Practical	Self-Study
	3	-	2	2
Examination Scheme (Marks)	Theory	MSE	TA	ESE
		40	20	40
		Practical	CIA	ESE
			50	50
Course Outcomes (COs):				
Upon successful completion of this course, the student will be able to:				
CO1	Explain the fundamentals of computer-aided structural modeling, including nodes, elements, supports, boundary conditions, load paths, and pre-/post-processing concepts.			
CO2	Analyze and interpret the behavior of 2D and 3D structural systems (beams, trusses, frames) under different loading conditions, and extract response quantities such as shear, bending moment, and axial forces.			
CO3	Design and detail reinforced concrete components (slabs, beams, columns) for axial, bending, and shear actions in compliance with IS codes, validating with manual checks.			
CO4	Develop and evaluate footing and foundation systems, ensuring safe load transfer, bearing pressure checks, and reinforcement detailing.			
CO5	Apply seismic and wind load provisions as per codes, assess structural response, and incorporate lateral stability elements such as shear walls, bracing, and cores.			
CO6	Generate , interpret, and communicate structural design reports, schedules, and reinforcement drawings in a professional engineering documentation format.			
Syllabus:				
Module	Contents			Lecture Hours
I	Introduction to Computer-Aided Structural Analysis Introduction to computer-aided design and analysis, Structural modelling: nodes, elements, supports, boundary conditions, Types of loads and load combinations, Load paths and static equilibrium, Concepts of pre-processing and post-processing			8
II	Analysis of 2D and 3D Frame Structures Analysis of beams, trusses, and rigid frames, Load effects on determinate and indeterminate structures, 2D vs. 3D frame modelling – orientation, member release, support types, Extraction and interpretation of results: Shear, BM, Axial forces			7
III	RCC Component Design and Detailing Design of slab, beam, and column components under axial, bending, and shear loads, Serviceability and strength limit states, detailing of reinforcement as per IS code, Validation of design results with hand calculations			8
IV	Foundation and Footing Design Introduction to isolated and combined footing modelling, Column-footing interaction, Load transfer mechanisms and bearing pressure checks, detailing of reinforcement for footings			8
V	Analysis under Seismic and Wind Loading Overview of lateral loads and structural irregularities, Seismic load modelling: base shear, response spectrum, load combinations, Wind load as per code – pressure coefficients, load direction, Use of shear walls, bracing, and core design for stability			7
VI	Report Generation and Structural Drafting Extraction of design reports: member schedules, reinforcement lists, Generation of structural drawings: plans, elevations, reinforcement details, Interpretation and verification of drawing output, Communication of design through professional documentation.			7
Total Lecture Hours				45


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Laboratory Work with CO Mapping:			
Sr. No.	Title of Lab Work		CO Mapped
1	Modeling of a simply supported beam with nodes, supports, and loads.		1
2	Analysis of a 2D truss with different boundary conditions.		1
3	Analysis of a 2D portal frame under uniform loading.		2
4	Modeling and analysis of a 3D multi-storey frame.		2
5	Design and detailing of RCC slabs (one-way and two-way).		3
6	Design and validation of an RCC column under combined loading.		3
7	Design of an isolated footing with reinforcement detailing.		4
8	Design of a combined footing under eccentric loading.		4
9	Seismic analysis of a multi-storey RC frame (Equivalent Static Method).		5
10	Wind load analysis of a tall building as per IS 875.		5
11	Extraction of design reports and member schedules from software.		6
12	Preparation of structural drawings (plan, elevation, reinforcement details) in CAD.		6
Total Practical Sessions		15	Total Tutorial Hours
			30
Text Books			
1. Krishnamoorthy, C. S., Finite Element Analysis: Theory and Programming, 2nd Edition, Tata McGraw-Hill, 1994.			
2. Ghali, A., Neville, A. M., & Brown, T. G., Structural Analysis: A Unified Classical and Matrix Approach, 6th Edition, CRC Press, 2017.			
3. Bhavikatti, S. S., Structural Analysis – Vol. I & II, Vikas Publishing House, 2010.			
4. Pandit, G. S., & Gupta, S. P., Structural Analysis: A Matrix Approach, Tata McGraw-Hill, 2008.			
5. Subramanian, N., Design of Reinforced Concrete Structures, Oxford University Press, 2014.			
6. Varghese, P. C., Limit State Design of Reinforced Concrete, 2nd Edition, Prentice Hall of India, 2010.			
References:			
1. Hibbeler, R. C., Structural Analysis, 10th Edition, Pearson, 2018.			
2. Wang, C. K., Salmon, C. G., & Pincheira, J. A., Reinforced Concrete Design, 7th Edition, Wiley, 2010.			
3. Bhavikatti, S. S., Advanced R.C.C. Design (R.C.C. Volume II), New Age International, 2013.			
4. McCormac, J. C., & Brown, R. H., Design of Reinforced Concrete, 10th Edition, Wiley, 2015.			
5. Weaver, W., & Gere, J. M., Matrix Analysis of Framed Structures, 3rd Edition, Springer, 1990.			
6. Kanchi, M. B., Matrix Methods of Structural Analysis, New Age International, 2010.			
7. Jain, A. K., Limit State Design of Reinforced Concrete, Nem Chand & Bros., 2012.			
8. Gambhir, M. L., Design of Reinforced Concrete Structures, 3rd Edition, PHI Learning, 2012.			
IS Codes:			
1. IS 456: 2000 – Code of Practice for Plain and Reinforced Concrete. Bureau of Indian Standards, New Delhi.			
2. IS 875 (Part 1 to 5): 1987 – Code of Practice for Design Loads (Dead, Live, Wind, Snow, Special Loads). Bureau of Indian Standards, New Delhi.			
3. IS 1893 (Part 1): 2016 – Criteria for Earthquake Resistant Design of Structures. Bureau of Indian Standards, New Delhi.			
4. IS 13920: 2016 – Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces. Bureau of Indian Standards, New Delhi.			
5. IS 1343: 2012 – Code of Practice for Prestressed Concrete. Bureau of Indian Standards, New Delhi.			
6. IS 2911 (Part 1 to 4): 2010 – Design and Construction of Foundations – Pile Foundations. Bureau of Indian Standards, New Delhi.			
7. IS 800: 2007 – General Construction in Steel – Code of Practice. Bureau of Indian Standards, New Delhi.			
Online Learning Resources:			
1. NPTEL: Structural Analysis I (Prof. Devdas Menon, IIT Madras). https://nptel.ac.in/courses/105106141			
2. NPTEL: Structural Analysis II (Prof. Devdas Menon, IIT Madras). https://nptel.ac.in/courses/105106145			
3. NPTEL: Design of Reinforced Concrete Structures (Prof. N. Subramanian). https://nptel.ac.in/courses/105105105			
4. NPTEL: Advanced Structural Analysis (Prof. Bhavin Mehta, IIT Roorkee).			

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https://nptel.ac.in/courses/105107123
5. MIT Open Course Ware: Finite Element Procedures for Solids and Structures (Prof. K. J. Bathe). https://ocw.mit.edu/courses/mechanical-engineering/2-094-finite-element-analysis-of-solids-and-fluids-i-fall-2009/
6. YouTube Playlist: ETABS Tutorial Series for Structural Design. https://www.youtube.com/playlist?list=PL9hGJr2s4lVjA0Qwb7GcFWY0XDIMifA0d
7. YouTube Playlist: STAAD.Pro Tutorials for Beginners. https://www.youtube.com/playlist?list=PLFC73M8GZr7A7DqYp7R6sh1W0S7Y2U4jG



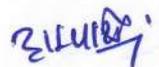

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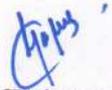

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		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist.: Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Civil Engineering					
Course Information:							
Class, Semester		F.Y.M. Tech, Semester - II				Category	PE
Course Code, Course Title		0SEPE514, Advanced Design of Prestressed Concrete				Type	LIT2
Prerequisites		-----					
Teaching Scheme (per week)		Lecture	Tutorial	Practical	Self-Study	Credits	
		3	--	2	2	4	
Examination Scheme (Marks)		Theory	MSE	TA	ESE	Practical	CIA
			40	20	40		50
							ESE
							--
Course Outcomes (COs):							
Upon successful completion of this course, the student will be able to:							
CO1	Analyze prestressed concrete beams and slabs, considering various prestressing methods and losses, as per IS 1343.						
CO2	Evaluate prestressed bridges and industrial structures, ensuring strength, serviceability, and durability under real-world loading conditions.						
CO3	Design prestressed foundations and tanks for soil interaction and hydrostatic pressures by considering seismic loads.						
CO4	Investigate the behaviour of prestressed shells, folded plates, and domes by applying advanced analytical techniques like FEM.						
CO5	Interpret thermal stresses and wind loads for prestressed silos and chimneys by integrating earthquake-resistant detailing.						
Syllabus:							
Module	Contents						Lecture Hours
I	Fundamentals of Prestressed Concrete: Concept, materials, systems, prestressing methods, classification, losses in prestress, IS 1343 provisions. Pre-stressing systems and end anchorages, losses of pre-stress.						8
II	Analysis and Design of Prestressed Beams & Slabs: Design of simply supported and continuous beams, one-way & two-way prestressed slabs, cable profiles, and serviceability checks. Analysis and deflections of beams of different cross sections for flexure, shear, bond and bearings, Cable layouts.						7
III	Prestressed Bridges and Industrial Structures: Types of prestressed bridges, design principles as per IRC codes, segmental construction, cantilever bridges, applications in industrial buildings						7
IV	Design of Prestressed Water tank: Design of prestressed water tanks, crack control, and detailing for hydrostatic and seismic forces.						8
V	Prestressed Shells, Folded Plates, and Domes: Continuous beams, folded plates and shells. Circular systems, domes and slabs, Analysis and design of shell structures, domes, and folded plates, IS 2210 guidelines						7
VI	Prestressed Chimneys, Silos: Tension and compression members. Design considerations for transmission poles, tall chimneys, and silos, impact of thermal stresses, wind loads, and lateral pressures.						8
Total Lecture Hours						45	
List of Tutorial with CO Mapping:							
Sr. No.	Title of Lab Work						CO Mapped
1	Numerical on calculation of prestressing force						1
2	Numerical on load transfer through end block (bursting tensile stress).						1
3	Calculation of total prestress losses for a simply supported prestressed beam.						2
4	Calculate stresses at top and bottom fibres for eccentric prestress force.						2
5	Design a simply supported post-tensioned rectangular beam with given span & loads.						3


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6	Design of one-way slab (post-tensioned) carrying live load & floor finish.	3
7	Design outline of a PSC I-girder bridge for given span & IRC Class 70R loading.	4
8	Design a circular prestressed water tank for 500 kL capacity.	5
9	Analysis of a spherical dome under uniform load.	5
10	Design check for a prestressed concrete chimney subjected to wind load.	5
Total Practical Sessions		15
Total Tutorial Hours		30
Text Books:		
1. N. Krishna Raju, Prestressed Concrete 4 th Edition Tata McGraw Hill Publ., 2012		
2. P. Dayaratnam, Prestressed Concrete Design, 2 nd Edition, Oxford & IBH Publishing, 2014.		
3. T.Y. Lin, Ned H. Burns, Limit State Design of Prestressed Concrete, 3 rd Edition, Wiley Publ., 2019		
4. R. Rajagopalan, Prestressed Concrete Structures, 2 nd Edition, Narosa Publishing House. 2014		
References:		
1. M.P. Saka, Finite Element Analysis of Prestressed Structures, 1st Edition, Elsevier Publishers, 2018.		
2. M.G. Arora Manish Goyal, Structural Analysis of Prestressed Concrete Elements, 1st Edition, CBS Publishers, 2015.		
3. J. Victor, Prestressed Concrete Structures, 1st Edition Oxford University Press, 2012.		
4. A. Ghali, R. Neville, Prestressed Concrete Bridges, 2nd Edition Taylor & Francis, 2011.		
Online Learning Resources:		
1. NPTEL Course on Advanced Prestressed Concrete design, by Prof. S.Suriya Prakash, IIT Hyderabad https://nptel.ac.in/courses/105106686		
2. NPTEL Course on Prestressed Concrete Structures, by Prof. Devdas Menon and Dr.Amlan K. Sengupta, IIT Madras https://nptel.ac.in/courses/105106117		



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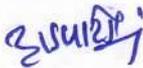
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		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist.: Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Civil Engineering						
Course Information:								
Class, Semester		F.Y.M. Tech, Semester - II				Category	PE	
Course Code, Course Title		0SEPE515, Smart Materials and Structures				Type	LIT2	
Prerequisites -----								
Teaching Scheme (per week)		Lecture	Tutorial	Practical	Self-Study	Credits		
		3	-	2	2	4		
Examination Scheme (Marks)		Theory	MSE	TA	ESE	Practical	CIA	ESE
			40	20	40		50	--
Course Outcomes (COs): Upon successful completion of this course, the student will be able to:								
CO1	Analyze the behavior and characteristics of smart materials for adaptive structural applications under varying environmental conditions.							
CO2	Design structural systems incorporating shape memory alloys, piezoelectric materials, and fiber optic sensors for enhanced performance and safety.							
CO3	Evaluate the efficiency of magnetorheological and electroactive polymer-based control systems in mitigating structural vibrations.							
CO4	Apply nanomaterials and fiber optic sensors for real-time structural health monitoring and damage detection.							
CO5	Assess various structural health monitoring techniques for condition assessment and predictive maintenance of infrastructure.							
CO6	Develop innovative smart structural systems integrating AI, digital twins, and self-healing materials for future civil engineering applications.							
Syllabus:								
Module	Contents						Lecture Hours	
I	Introduction to Smart Materials and Structures Fundamentals of smart materials, classification, and properties. Concept of adaptive and intelligent structures. Applications of smart materials in civil engineering. Fundamentals of sensors, actuators, and transducers in structural health monitoring.						8	
II	Shape Memory Alloys and Piezoelectric Materials Characteristics and behavior of shape memory alloys (SMA). Applications of SMA in vibration control, damping, and structural rehabilitation. Principles of piezoelectric materials, their electromechanical coupling, and applications in energy harvesting and damage detection.						7	
III	Fiber Optic Sensors and Nanomaterials Working principles of fiber optic sensors, types, and their applications in real-time structural health monitoring. Introduction to nanomaterials in civil engineering, carbon nanotubes (CNTs), graphene, and their role in enhancing structural properties.						7	
IV	Magnetorheological and Electroactive Polymers Concepts of magnetorheological (MR) and electrorheological (ER) fluids. Application in vibration control devices such as MR dampers and ER actuators. Properties, working mechanisms, and applications of electroactive polymers (EAPs) in adaptive structures.						8	
V	Structural Health Monitoring (SHM) Techniques Introduction to SHM, damage detection techniques, and data interpretation. Advanced SHM techniques such as acoustic emission, guided wave propagation, and artificial intelligence-based monitoring. Case studies of SHM applications in bridges, buildings, and other infrastructure.						8	
VI	Smart Structural Systems and Future Trends Integration of smart materials and SHM for intelligent infrastructure. Self-healing materials and their applications in construction. Emerging trends in smart structures, digital twin technology, and AI-driven predictive maintenance strategies.						7	
Total Lecture Hours						45		


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List of Experiments with CO Mapping:			
Sr. No.	Title of Eab Work		CO Mapped
1	Characterization of shape memory alloys for structural applications.		1
2	Piezoelectric energy harvesting experiment using vibration-based setup.		2
3	Testing of fiber optic sensors for strain measurement in structural components.		2 & 4
4	Analysis of nanomaterial-enhanced concrete for mechanical properties.		4
5	Application of electrorheological fluids in smart actuator systems.		3
6	Structural health monitoring of concrete specimens using acoustic emission technique.		5
7	Study of self-healing concrete properties and crack closure mechanisms.		6
8	Real-time monitoring of structures using embedded smart sensors.		4, 5, & 6
9	Demonstration of Magnetorheological (MR) damper for vibration control.		3 & 4
10	Case study on digital twin technology for predictive maintenance of buildings		6
Total Practical Sessions		15	Total Practical Hours
			30
Text Books:			
1. M.V. Gandhi and B.D. Thompson, Smart Materials and Structures, 1st Edition, Chapman & Hall, 2017.			
2. Mohsen Shahinpoor, Fundamentals of Smart Materials, 1st Edition, Royal Society of Chemistry, 2020.			
3. Daniel Balageas, Structural Health Monitoring Using Smart Sensors, 1st Edition, Wiley, 2014.			
4. Mel Schwartz, Smart Materials and Technologies, 1st Edition, CRC Press, 2017.			
References:			
1. Dimitris C. Lagoudas, Shape Memory Alloys: Modeling and Engineering Applications, 1st Edition, Springer, 2008.			
2. Kenji Uchino, Advanced Piezoelectric Materials: Science and Technology, 2nd Edition, Woodhead Publishing, 2017.			
3. Charles R, Structural Health Monitoring: A Machine Learning Perspective, 1st Edition, Wiley, 2012.			
4. Kasthurirangan Gopalakrishnan and Bharath, Nanotechnology in Civil Infrastructure: A Paradigm Shift, 1st Edition, Springer, 2011.			
Codes:			
1. IS 16050-2022- Guidelines for Smart Materials in Construction.			
2. IS 13827-2021- Structural Health Monitoring Standards.			
3. IS 15368-2020- Fiber Optic Sensor Applications in Structures			
4. IS 14847-2019- Nanomaterials in Civil Engineering			
5. IS 17201-2023- Shape Memory Alloys in Structural Applications			
Online Learning Resources:			
1. Prof. Bishakh Bhattacharya and Prof. Nachiketa Tiwari, Smart Materials - NPTEL Course, IIT Kanpur, https://nptel.ac.in/courses/112104173 .			
2. Smart Structures - Swayam - NPTEL, covering piezoelectric materials, shape memory alloys, and others, https://onlinecourses.nptel.ac.in/noc23_ae19/preview			



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		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist.: Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Civil Engineering					
Course Information:							
Class, Semester		F.Y.M. Tech, Semester - II				Category	MA
Course Code, Course Title		0SEMA516, Seminar				Type	L2
Prerequisites		-----					
Teaching Scheme (per week)		Lecture	Tutorial	Practical	Self-Study	Credits	
		--	--	4	--	2	
Examination Scheme (Marks)		Theory	MSE	TA	ESE	Practical	CIA
			--	--	--		50
Examination Scheme (Marks)							ESE
							--
Course Outcomes (COs):							
Upon successful completion of this course, the student will be able to:							
CO1	Summarize a comprehensive seminar report that accurately presents their findings and conclusions with the help of various resources.						
CO2	Apply proper citation and referencing techniques to avoid plagiarism in their seminar report by using modern techniques.						
CO3	Compare formatting guidelines to restructure a report for academic purposes by using word processing software.						
CO4	Examine their own presentation skills for improvement in identified areas taking into consideration suggestions given by guide and experts						
Syllabus:							
Contents							
Individual students are required to choose a topic of their interest from related topics to the stream of specialization, preferably from outside the M. Tech. curriculum. The students are required to review literature on the topic and deliver seminar. A committee consisting of at least three faculty members (preferably specialized in the respective stream headed by HOD wherein guide should be one of the members) shall assess the presentation of the seminar and award marks to the students based on merits of topic of presentation.							
Each student shall submit two copies of a report of seminar. The seminar report shall not have any plagiarized content (all sources shall be properly cited or acknowledged). One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other shall be kept in the departmental library. Internal continuous assessment marks are awarded based on the relevance of the topic, presentation skill, quality of the report and participation. It is encouraged to do simulations/ experimentation related to the chosen topic and present the results at the end of the semester.							
Text Books							
1. Relevant textbooks for selected knowledge area/areas.							
References:							
1. Relevant reference books, Journal publications, conference publications, open web sources etc. for selected knowledge area/areas.							
Online Learning Resources:							
3. Relevant NPTEL/ MOOC Courses for selected knowledge area/areas.							


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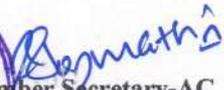

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		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist.: Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Civil Engineering					
Course Information:							
Class, Semester		F.Y.M. Tech, Semester - II				Category	VS
Course Code, Course Title		0SEVS517, Pedagogy Studies				Type	T2
Prerequisites		-----					
Teaching Scheme (per week)		Lecture	Tutorial	Practical	Self-Study	Credits	
		2	--	--	--	--	
Examination Scheme (Marks)		Theory	MSE	TA	ESE	Practical	CIA
			--	50	--		--
Course Outcomes (COs):							
Upon successful completion of this course, the student will be able to:							
CO1	Explain the importance of disseminating research findings to various stakeholders with bridge the gap between research and practice.						
CO2	Apply appropriate research methods and searching techniques to conduct a literature review by using available advanced tools.						
CO3	Compare the effectiveness of different community engagement strategies in enhancing student learning by considering appropriate evaluation methods.						
CO4	Analyze the curriculum and practicum components to determine their potential impact on effective pedagogy with the help of established pedagogical frameworks.						
Syllabus:							
Module	Contents						Lecture Hours
I	Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and searching. Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher						08
II	Evidence on the effectiveness of pedagogical practices: Methodology for the in-depth stage: quality assessment of included studies, how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy, Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies						07
III	Professional Development: Alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes						08
IV	Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.						07
Total Lecture Hours						30	
Text Books:							
1. Sarkar, Srikrishna, The Pedagogy of Teaching, Red shine Publication, 1st Edition, 2024.							
2. Wiske, Martha Stone, Teaching for Understanding: Linking Research with Practice, Jossey-Bass, 2nd Edition, 2013.							
3. Dean, Ceri B., Elizabeth Hubbell, Howard Pitler & B. Stone, Classroom Instruction That Works: Research-Based Strategies for Increasing Student Achievement, ASCD, 2nd Edition, 2012.							


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| 4. Tomlinson, Carol Ann, Differentiated Instruction: Responding to the Needs of All Learners, ASCD, 3rd Edition, 2014 |
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| 1. Alexander, Robin J., English for Culture and Pedagogy: International Comparisons in Primary Education, Wiley, 1st Edition, 2011. |
| 2. Sawyer, R. Keith, The Cambridge Handbook of the Learning Sciences, Cambridge University Press, 3rd Edition, 2023. |
| 3. Gay, Geneva, Cultural Relevance and Educational Issues: Language, Race, and Class in U.S. Schools, Routledge, 3rd Edition, 2014. |
| 4. Gitomer, Drew & Cynthia A. Bell, Handbook of Research on Teaching, American Educational Research Association (AERA), 5th Edition, 2016. |

Online Learning Resources:

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|---|
| 1. NPTEL Course on English for Research Paper Writing , by Dr. Shoba K. N., NITTTR, Chennai
https://onlinecourses.swayam2.ac.in/ntr25_ed81/preview |
| 2. Coursera – Learning to Teach Online , by UNSW Sydney (The University of New South Wales)
https://www.coursera.org/learn/teach-online |



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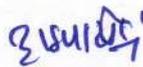
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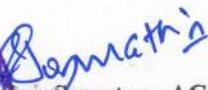
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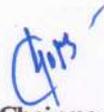
 Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist.: Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Civil Engineering			
Course Information:			
Class, Semester	F. Y. M. Tech, Semester – II (Exit Course)		Category VS
Course Code, Course Title	0SEVS518, Domain Specific Internship for 8 Weeks		Type LI
Prerequisites	-----		
Teaching Scheme (per week)	Lecture	Tutorial	Credits
	--	--	10
Examination Scheme (Marks)	Theory	MSE	ESE
		--	--
		TA	Practical
		--	50
		ESE	ESE
		--	50
Course Outcomes (COs):			
Upon successful completion of this course, the student will be able to:			
CO1	Demonstrate technical skills, effective communication, and teamwork by collaborating with mentors, supervisors, and project teams to achieve project objectives.		
CO2	Apply core concepts of civil engineering to actively participate in real-world industry projects, related to design and construction.		
CO3	Analyze technical challenges in industry-based projects to identify root causes and propose feasible solutions considering sustainability and societal impact.		
CO4	Examine the performance and functionality of tools, systems, or software through inspection, testing, and data analysis to ensure compliance with technical requirements and industry standards.		
CO5	Develop comprehensive project reports and technical presentations, highlighting problem statements, methodologies, technical contributions, and results to facilitate knowledge sharing with industry mentors and project stakeholders.		
Syllabus:			
Contents			
Week 1–2: Introduction to the Organization/Project			
<ul style="list-style-type: none"> • Orientation on the industry environment and projects. • Introduction to the software and tools used in the industry (e.g., STAAD Pro, SAP2000, ETABS, Revit, AutoCAD, etc.). • Overview of the assigned project or industry work. • Understanding the scope of work, objectives, and deliverables. 			
Week 3–4: Structural Design and Analysis Tasks			
<ul style="list-style-type: none"> • Participating in ongoing structural design and analysis tasks using CAE tools. • Conducting analysis of simple and complex structures (beams, slabs, columns, etc.) under various load conditions. • Use of computer tools to optimize structural designs, verify code compliance, and assess safety factors. • Exposure to foundation design, load distribution, and material selection in structural projects. 			
Week 5–6: Project Documentation and Reporting			
<ul style="list-style-type: none"> • Understanding and preparing project reports with design calculations, drawings, and analysis results. • Preparing detailed reports on structural systems used in the field project. • Learning best practices for documentation in an engineering context (design notes, drawings, specifications). 			
Week 7–8: Presentation and Feedback			
<ul style="list-style-type: none"> • Preparing a final presentation of the field project outcomes. • Discussing challenges faced, lessons learned, and the application of computer-aided design tools. • Receiving feedback from industry professionals and academic mentors. Final project submission, including all work completed during OJT/FP (designs, analysis, reports, etc.)			
Evaluation:			
<ul style="list-style-type: none"> • Internship Report (50%): Students must submit a detailed report outlining the tasks performed, tools used, design processes, and results. • Presentation (30%): Students will present their project outcomes to faculty and industry mentors, demonstrating their understanding and application of software and structural concepts. 			


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- Project Feedback (20%): Evaluation from industry professionals regarding the student's performance, initiative, and problem-solving abilities.

Recommended Tools/Software:

- STAAD Pro
- ETABS
- SAP2000
- AutoCAD
- Revit
- ANSYS (for advanced analysis)
- MS Office (for report writing and documentation)

Text Books:

1. Relevant textbooks for selected knowledge area/areas.

References:

1. Relevant reference books, Journal publications, conference publications, open web sources etc. for selected knowledge area/areas.

Online Learning Resources:

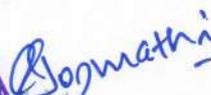
1. Relevant NPTEL/ MOOC Courses for selected knowledge area/areas.



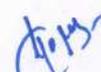
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