Walchand College of Engineering

(Government Aided Autonomous Institute)

Vishrambag, Sangli-416415

S. Y. M. Tech. (Civil - Structural Engineering) Sem-III and IV

Effective from AY 2024-25

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information	
Programme	M. Tech. Civil - Structural Engineering
Class, Semester	Second year M. Tech., Semester III
Course Code	7ST691
Course Name	Dissertation Phase - I
Desired Requisites:	Courses of Semester I and II of F. Y. M. Tech (Civil - Structural Engineering)

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	24 Hrs/week	**LA1**	**LA2**	**ESE**	**Total**
		30	30	40	100
		Credits: 12			

Course Objectives	
1	To impart knowledge for establishing objectives by carrying out extensive literature review on selected dissertation topics.
2	To develop methodology to execute the proposed research work through analytical/experimental work.
3	To analyse, interpret, debate, and classify the findings of the work.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Execute** detailed literature survey to understand research developments and set up research hypotheses.	Applying
CO2	**Construct** research methodology to evaluate the research hypothesis.	Analysing
CO3	**Assess** research idea with perspective scope.	Evaluating
CO4	**Devise** the research objectives to solve the given problem formulated through literature study.	Creating

Contents

The dissertation work will start in semester III, and should involve scientific research, design, collection, and analysis of data, determining solutions and must bring out the individual's contribution. Dissertation Phase 1 will have presentation and report submission (synopsis). The presentation will include identification of the research problem based on the extensive literature review on the topic referring to latest literature available, defining objectives of the work, and the methodology to be adopted.

References

1	National and International journals, Conference Proceedings in Structural Engineering.
2	Technical Reports of Professional societies.
3	International and national codes of Practices and Handbooks.
4	Internet sources and Distance Learning.
5	Published Ph.D. and M. Tech Thesis of Reputed Institutes.

CO-PO Mapping

	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1			2	2		3
CO2			2	2		3
CO3	1		2			2
CO4	1				3	3

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing (min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course.				

Walchand College of Engineering, Sangli

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AY 2024-25

Course Information

Programme	M. Tech. (Civil Structural Engineering)
Class, Semester	Second Year M. Tech., Semester III
Course Code	7ST611
Course Name	NPTEL Course - Advanced Concrete Technology
Desired Requisites:	Concrete technology

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
		30	20	50	100
		Credits: 3			

Course Objectives

1	To demonstrate a comprehensive understanding of fundamental concepts in concrete technology, including cement production, composition, and the role of aggregates and chemical admixtures.
2	To apply advanced techniques for proportioning high-performance concrete mixtures, considering factors such as strength, durability, and workability, to meet specific project requirements
3	To develop the ability to critically analyse and evaluate the properties of hardened concrete, including strength, durability, creep, and shrinkage, and propose appropriate solutions or improvements to enhance concrete performance and durability

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	**Explain** the composition of different types of cement and their basic chemical and physical properties	II	Understanding
CO2	**Evaluate** the suitability of aggregates and chemical admixtures for specific concrete applications	V	Evaluating
CO3	**Assess** the effects of mineral admixtures on concrete properties and performance	V	Evaluating
CO4	**Compare** and contrast different mixture proportioning methods and their impact on concrete properties	IV	Analysing
CO5	**Assess** the factors influencing the properties of hardened concrete over time and propose potential solutions or improvements	V	Evaluating
CO6	**Develop** maintenance strategies to enhance the durability and longevity of concrete infrastructure	VI	Creating

Module	**Module Contents**	**Hours**
I	Cement production and composition, Cement chemistry	7
II	Aggregates for concrete, Chemical admixtures	7
III	Chemical and Mineral admixtures, Mineral admixtures	6
IV	High performance concrete mixture proportioning, Topics in fresh concrete	7
V	Topics in hardened concrete, Creep and shrinkage	6
VI	Durability of concrete	6

Textbooks

1	Mehta, P. K., and Monteiro, P. J. M., 'Concrete: Microstructure, Properties, and Materials,' Fourth Edition (Indian Edition), McGraw Hill, 2014
2	Rafat Siddique, "Special Structural Concretes", Galgotia Publication Private Ltd.,2000
References	
1	Neville, A. M., 'Properties of Concrete,' Pitman Publishing, Inc., MA, 1981.
2	Hewlett, P. C., Ed., 'Lea's Chemistry of Cement and Concrete,' Fourth Edition, Arnold Publishers, NY, 1998.
3	Bentur, A., Diamond, S., and Berke, N.S., 'Steel Corrosion in Concrete,' E&FN Spon, UK, 1997.
4	Taylor, H. W. F., 'Cement Chemistry,' Academic Press, Inc., San Diego, CA, 1990.
5	Lea, F. M., 'The Chemistry of Cement and Concrete,' Chemical Publishing Company, Inc., New York, 1971.
6	Mindess, S., and Young, J. F., 'Concrete,' Prentice Hall, Inc., NJ, 1981.
7	J. Newman and B. S. Choo, Eds., 'Advanced Concrete Technology', Four Volume Set, Elsevier, 2003
Useful Links	
1	NPTEL :: Civil Engineering - Concrete Engineering and Technology
2	https://onlinecourses.nptel.ac.in/noc24_ce104/preview

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1		2			1	
CO2	2		3	2		
CO3		3	1			2
CO4	3					3
CO5			2		2	
CO6	3					3
The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2:Medium, 3:High. Each CO of the course must map to at least one PO.						

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2024-25

Course Information	
Programme	M. Tech. Civil - Structural Engineering
Class, Semester	Second year M. Tech., Sem. III
Course Code	7ST612
Course Name	NPTEL Course – Bridge Engineering
Desired Requisites:	Structural Analysis, Solid Mechanics, Design of Concrete Structure, Design of Steel Structure

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs./week	**MSE**	**ISE**	**ESE**	**Total**
		30	20	50	100
		Credits: 3			

Course Objectives	
1	To provide knowledge of loads and analysis for different types of bridges.
2	To impart knowledge for design of different types of bridges including substructures with relevant codes.
3	To provide knowledge for construction, inspection and maintenance of bridges.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Understand** the different types of bridges, its importance and selection.	Understanding
CO2	**Illustrate** components of bridges and its necessity based on various types of bridges.	Applying
CO3	**Analyze** various types of bridges with appropriate loads and methods.	Analyzing
CO4	**Estimate** the stresses in the bridge components and decide the reinforcement details.	Evaluating
CO5	**Design** the components of bridges and bearings following all safety measures.	Creating
CO6	**Propose** various techniques of construction, maintenance and rehabilitation of bridges considering serviceability during its lifetime.	Creating

Module	**Module Contents**	**Hours**
I	Introduction Reinforced concrete slab bridge decks	6
II	RC culverts, Pipe culvert, Box culvert Steel truss bridges	6
III	Plate girder bridges Arch bridges, Suspension bridges, Cable stayed bridges, Balanced cantilever bridges	7
IV	Prestressed concrete bridges and Composite bridges Rigid Frame Bridges and Continuous Girder Bridges	7
V	Piers, Abutments, and Foundation Bridge bearings, Joints and Appurtenances.	7
VI	Construction, Maintenance and Rehabilitation of bridges Advanced topics in bridge engineering	6

Textbooks	
1	Krishna Raju N., "Design of Bridges, Oxford and IBH Publishing Co. Ltd.", New Delhi and Kolkata, 2001.

2	Johnson Victor, “Essentials of Bridge Engineering, Oxford and IBH Publishing Co. Ltd.”, 5th Edition, 2001.
3	Jagdeesh T. R., Jayaram M. A., “Design of Bridge Structures, Prentice Hall of India Pvt. Ltd.”, New Delhi, 2003.
References	
1	S. Ponnuswamy, “Bridge Engineering”, McGraw Hill Education LLC., 2nd Edition, 2008.
2	Raina V. K., “Concrete Bridge Practice: Construction and maintenance and rehabilitation”, Tata Mc Graw Hill Publishing Company, New Delhi.
3	Raina V. K., “Concrete Bridge Practice: Analysis, design and economics”, Tata Mc Graw Hill Publishing Company, New Delhi.
4	IRC Codes.
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc24_ce79/preview
2	
3	
4	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	1	2	2			
CO2			3			
CO3				3		
CO4				2		3
CO5					3	3
CO6		2			2	3
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher’s assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2024-25

Course Information

Programme	M Tech. Civil Structural Engineering
Class, Semester	Second Year M. Tech, Sem III
Course Code	7ST613
Course Name	NPTEL Course - Computer Methods of Structural Analysis of Offshore Structures
Desired Requisites:	Structural Analysis, Structural Dynamics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
		30	20	50	100
		Credits: 3			

Course Objectives

1	To give an understanding to computer aided design process which includes mathematical representation offshore structures, Engineering Optimisation and Database systems.
2	To identify types of offshore structure and its advantages.
3	To enhance knowledge and skills in offshore structure analysis with modern computer methods.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Levels**	**Bloom's Taxonomy Description**
CO1	**Examine** the indeterminacy of 2D 3D frames and structures.	III	Applying
CO2	**Discover** various types of offshore structures, based on functional applications and advantages.	III	Applying
CO3	**Analyse** the Planar orthogonal and non-orthogonal structures using stiffness method.	IV	Analysing
CO4	**Illustrate** the deflections in planar truss systems using stiffness method.	IV	Analysing
CO5	**Evaluate** the seismic performance of offshore structure using response spectrum.	V	Evaluating
CO6	**Solve** the numerical on dynamic analysis of offshore structures with consideration of fatigue loads.	VI	Creating

Module	**Module Contents**	**Hours**
I	Indeterminate structures, Space frames	6
II	Stiffness method: Planar orthogonal structures, Stiffness method: Planar non-orthogonal structures	8
III	Stiffness method: Planar truss systems, Stiffness method: 3D analysis	6
IV	Types of offshore structures, New-generation offshore platforms	6
V	Environmental loads, Dynamic analysis, Response spectrum	7
VI	Analysis under fatigue loads, Random process	6

Textbooks

1	Arvid Naess and Torgeir Moan. 2013. Stochastic dynamics of marine structures, Cambridge University Press, New York, USA.
2	Chakrabarti, S. K. 1987. Hydrodynamics of Offshore Structures: Computational Mechanics.
3	Benjamin, JR and Cornell, CA. 1970. Probability, statistics and decisions for civil engineers, John Wiley, New York.

4	Chakrabarti, S. K. 1990. Non-linear methods in offshore engineering, Elsevier Science Publisher, The Netherlands.
References	
1	ASTM E 1049-85. 2005. Rain flow counting method, 1987.
2	Srinivasan Chandrasekaran and R. Nagavinothini. 2020. Offshore compliant platforms: Analysis, design and experimental studies, Wiley, U.K, Wiley, U.K, ISBN: 978-1-119-66977-7
3	Srinivasan Chandrasekaran. 2019. Advanced steel design of structures. CRC press, Florida, ISBN: 978-036-72-3290-0
4	Srinivasan Chandrasekaran. 2019. Structural Health Monitoring with application to offshore structures, World Scientific Publishing Co., Singapore, ISBN: 978-971-12-0108-0
5	Srinivasan Chandrasekaran. 2018. Advanced structural analysis with MATLAB, CRC Press, Florida, USA, ISBN: 978-036-70-2645-5.
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc24_oe05/preview

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	3					
CO2		2	2			
CO3			3	2		
CO4			2		1	3
CO5			2		1	3
CO6		2		3		1
The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High. Each CO of the course must map to at least one PO.						

Assessment
The assessment is based on MSE, ISE, and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of a teacher's assessment. Mode of assessment can be field visits, assignments, etc., and is expected to map at least one higher-order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing).

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AY 2024-25

Course Information

Programme	M Tech. (Civil Structural Engineering)
Class, Semester	Second Year M. Tech, Sem III
Course Code	7ST614
Course Name	NPTEL Course - Introduction to Engineering Seismology
Desired Requisites:	Earthquake Engineering

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
		30	20	50	100
		Credits: 3			

Course Objectives

1	To explain the principles of plate tectonics and their correlation with seismic activity, including the identification of plate boundaries and their impact on earthquake occurrences
2	To apply knowledge of seismic wave characteristics to interpret seismic records accurately, thereby assessing earthquake intensity, magnitude, and energy release
3	To apply methodologies to estimate seismic hazard parameters, such as seismic zonation, attenuation relations, and recurrence relations, enabling effective assessment of earthquake risk in specific regions

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	**Understand** the concept of plate tectonics and its relation to seismic activity	Understanding
CO2	**Apply** knowledge of seismic wave characteristics to interpret earthquake intensity and magnitude	Applying
CO3	**Interpret** seismic records effectively using earthquake instrumentation.	Applying
CO4	**Apply** predictive models to estimate seismic hazard parameters for specific regions.	Applying
CO5	**Create** tectonic maps using earthquake catalogue data and understand their significance in assessing seismic hazard	Creating
CO6	**Analyse** seismic hazard using deterministic and probabilistic methods, integrating rupture-based approaches and case studies	Analysing

Module	**Module Contents**	**Hours**
I	**Earthquake Hazard and Basic Seismology** Introduction to earthquake hazards- Global seismicity and Seismic risk, History of Engineering Seismology and Earthquake types. Elastic Rebound Theory; Earthquake sources; Plate tectonics, and Plate Boundaries: Continental Drift	6
II	**Seismic Waves and Energy** Theory of Wave Propagation Seismic wave propagation, Types of seismic waves, Wave characteristics and Shadow zones Concept of Earthquake Measurement, Seismic Intensity and Magnitudes Scales, Past earthquake Energy and Comparable Explosive tests	6
III	**Earthquake Instrumentation** Earthquake Instruments, Sensors and Data Loggers, Mechanical and Digital sensors; Seismic Station, Interpretation of Seismic Records: Identification of made events and natural earthquake; Time and frequency domain characteristic of ground motion	6
IV	**Seismic Zonation and Predictive Models**	6

	Regional Seismicity, Earthquakes in India and Most Important Global Earthquakes; Concept of Seismic Zonation and Methodology for Seismic micro-zonation, Predictive Models in Earthquake Engineering- Attenuation Relation; Intensity, Duration and Ground Motion Predictive Relations	
V	**Seismotectonic Maps** Earthquake Catalog preparation, Source Map preparation; Homogenization and Declustering of earthquake data and preparation of Seismotectonic maps Seismic Hazard Parameters: a and b values, Recurrence relations and Maximum magnitude: Region Specific Approach for estimation Parameters and Selection of predictive equations	7
VI	**Seismic Hazard Analysis** Deterministic and Probabilistic Methods; Rupture based approach Seismic Hazard Analysis Case studies and Worked examples	8
Textbooks		
1	A.K. Chopra, "Dynamics of Structure: Theory & Application to Earthquake Engineering", Pearson Education Lim., 4th Edition, 2014	
2	P. Agarwal and M. Shrikhande, "Earthquake Resistant Design of Structures", PHI publications, New Delhi, 3rd Edition, 2006	
3	D. J. Dowrick, "Earthquake Resistant Design for Engineers & Architects", John Wiley & Sons,2nd Edition, 1987	
References		
1	David Key, "Earthquake Design Practice for Buildings", Thomas Telford Publication, London, 2nd Edition, 2006	
2	James M. Kelly, "Earthquake Resistant Design with Rubber", Springler-Verlag Publication, London, 2nd Edition, 2012	
3	Manual of "Earthquake Resistant Non-Engineering Construction", University of Roorkee, 2000	
Useful Links		
1	https://onlinecourses.nptel.ac.in/noc24_ce70/preview	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1			2			
CO2			3	2		3
CO3	2			3		3
CO4	2	1		2		
CO5		3			2	
CO6			2			2
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High. Each CO of the course must map to at least one PO.						

Assessment
The assessment is based on MSE, ISE, and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of a teacher's assessment. Mode of assessment can be field visits, assignments, etc., and is expected to map at least one higher-order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing).

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AY 2024-25

Course Information

Programme	M. Tech. Structural Engineering
Class, Semester	Second Year M. Tech., Semester I
Course Code	7ST615
Course Name	NPTEL – Optimization Methods for Civil Engineering
Desired Requisites:	Engineering Mathematics, Civil Engineering courses.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives

1	To provide knowledge of optimization approach and significance of optimization.
2	To impart knowledge of application of optimization tools required for analyzing and solving problems in civil engineering fields.
3	To provide exposure to modern techniques of global optimization for optimization of Processes/systems in engineering field in general.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	**Define** various optimization problems and techniques.	Remembering
CO2	**Explain** optimization problems and techniques by classifying and relating them.	Understanding
CO3	**Construct** unconstrained and constrained optimization problems using different methods	Applying
CO4	**Examine** various optimization techniques for solution of linear, nonlinear, and general optimization problems.	Analyzing
CO5	**Evaluate** various optimization problems in engineering field.	Evaluating
CO6	**Create** optimized global engineering designs of civil engineering facilities having different complexity.	Creating

Module	**Module Contents**	**Hours**
I	**Classical Optimization Techniques** Introduction: Introduction to optimization, engineering applications of optimization, Formulation of structural optimization problems as programming problems. Optimization Techniques: Classical optimization techniques, single variable optimization, multivariable optimization with no constraints, unconstrained minimization techniques and algorithms constrained optimization solutions by penalty function techniques, Lagrange multipliers techniques and feasibility techniques.	7
II	**Linear Programming:** Linear programming, standard form of linear programming, geometry of linear programming problems, solution of a system of linear simultaneous equations, pivotal production of general systems of equations, simplex algorithms, revised simpler methods, duality in linear programming.	6
III	**Non-linear programming** Non-linear programming, one dimensional minimization methods, elimination methods, Fibonacci method, golden section method, interpolation methods, quadratic and cubic methods, Unconstrained optimization methods, direct search methods, random search methods, descent method.	7

IV	**Constrained optimization:** Constrained optimization techniques such as direct methods, the complex methods, cutting plane method, exterior penalty function methods for structural engineering problems. Formulation and solution of structural optimization problems by different techniques.	6
V	**Optimization by Metaheuristic Algorithms-I** Particle Swarm Optimization, Introduction, Computational Implementation, Solution of the Constrained Optimization Problem, Ant Colony Optimization, Basic Concept, Ant Searching Behavior, Path Retracing and Pheromone, Updating, Pheromone Trail Evaporation, Algorithm. Examples-.Simulated annealing, Procedure, Algorithm, Features of the Method, Optimization	6
VI	**Optimization by Metaheuristic Algorithms-II** Genetic algorithm, Representation of design variables, Representation of Objective Function and Constraints, Genetic Operators, Algorithm flowchart, Design examples. Fuzzy Set Theory, Optimization of Fuzzy Systems, Computational Procedure, Numerical Example, Neural-Network-Based Optimization. Taguchi Method.	7

Textbooks	
1	Singiresu S. Rao, "Engineering Optimization-Theory and Practice", New Age International Publishers, 2013, 4th Edition.
2	Edwin P K Chong, Stainslaw Zak ,"An Introduction to Optimization" John Wiley & Sons, Inc ,2008.
References	
1	M.S. Bazaraa, H.D. Sherali and C. Shetty, "Non-Linear Programming-Theory and Algorithms", John Wiley and Sons, New York, 1993.
2	Spunt, "Optimum Structural Design"- Prentice Hall, 2011
3	Du, Ke-Lin, Swamy, M. N. S., "Search and Optimization by Metaheuristics", Birkhäuser Basel- Springer International, 1st Edition, 2016
4	C.J. Ray, Optimum Design of Mechanical Elements , Wiley, 2007
5	D. E. Goldberg, Genetic algorithms in Search, Optimization, and Machine Learning , Addison-Wesley Longman Publishing, 1989.
Useful Links	
1	https://nptel.ac.in/courses/105/108/105108127/
2	https://nptel.ac.in/courses/103/103/103103164/
3	Web links and Video Lectures (e-Resources): https://www.youtube.com/watch?v=wEdZLKMMZ8o&list=PLwdnzlV3ogoXKKb9nABDWYltTDgi37lYD https://www.youtube.com/watch?v=GMTvoKRfxQw&list=PLGbjwqYC00hsy6XGalOBAphm2tdeLbgK0 https://www.youtube.com/watch?v=fszNBvdfKrY

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	1					
CO2	1		1			
CO3	1		2			
CO4	2		2			1

CO5	2		3	2	1	1
CO6	2		3	2	1	1

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2024-25

Course Information

Programme	M. Tech. Civil - Structural Engineering
Class, Semester	Second year M. Tech., Semester IV
Course Code	7ST692
Course Name	Dissertation Phase II
Desired Requisites:	Dissertation Phase I

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	34 Hrs/week	**LA1**	**LA2**	**ESE**	**Total**
		30	30	40	100
		Credits: 17			

Course Objectives

1	To analyze/experiment selected research topic further.
2	To review, classify and consolidate observations/results based on the detailed analytical/ experimental work.
3	To document the research work in the prescribed format and present it effectively.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	
CO1	**Apprise** analytical/experimental work in detail for the selected research problem.	Applying
CO2	**Classify** and assess research outcomes critically.	Analysing
CO3	**Compose** and conclude the results for presentation and dissertation report writing.	Evaluating
CO4	**Author** a research paper/s and publish in reputed journal/s as a contribution to engineering fraternity.	Creating
CO5	**Invent** comprehensive solution leading to sustainable infrastructure development.	Creating

Contents

Dissertation Phase II will have the analysis of the research problem based on defined objectives. Students will present their work in two internal phases in front of evaluation committee. The end semester evaluation of the complete work will be carried out with external examiner. The external examiner should evaluate the students based on the completion of work, findings of the study, report submission, contributions to the body of knowledge (in the form of conference paper, journal paper, patent) etc.

References

1	National and International journals, Conference Proceedings in Structural Engineering.
2	Technical Reports of Professional societies.
3	International and national codes of Practices and Handbooks.
4	Internet sources and Distance Learning.
5	Published Ph.D. and M. Tech Thesis of Reputed Institutes.

CO-PO Mapping

	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1			2	2		3

CO2			2	2		3
CO3	1		2			2
CO4				2	3	3
CO5			2	2	1	3
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.						

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing (min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course.				

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information

Programme	M. Tech. Civil - Structural Engineering
Class, Semester	Second Year M. Tech., Semester IV
Course Code	7ST645
Course Name	Internship
Desired Requisites:	Courses taught in semester I and II

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	-	-	100	100
Practical	4 Hrs./Week	**Credits: 2**			

Course Objectives

1	To expose the students to real life engineering problems encountered in industry/society.
2	To provide an opportunity to work in collaborative and multidisciplinary environment.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	Description	Blooms Taxonomy	
		Descriptor	Level
CO1	***Perceive*** knowledge of group dynamics and contribute to multidisciplinary work.	Understand	II
CO2	***Demonstrate*** knowledge to solve societal problems and ***apply*** it for efficient management of projects independently and in teams.	Apply	III
CO3	***Communicate*** with industry/society regarding engineering activities effectively and ***comprehend*** and write effective reports.	Understand	II
CO4	***Demonstrate*** ethical behaviour with professional code of conduct and contribute to sustainable development of society.	Apply	III

Contents

The objective of this training is to expose the students to industry environment and practices. Students are sent to leading Engineering organizations/Research laboratories/Design and Consultancy organizations to undergo a rigorous training for a minimum period of **one month** during summer term/vacation.

CO-PO Mapping

	Programme Outcomes (PO)					
	1	2	3	4	5	6
CO1					2	
CO2				2		
CO3		2				
CO4					2	

Assessment

- The assessment is based on ESE. The panel of minimum two members from the department shall assess the student for the internship.
- The students are expected to present the work done in an internship tenure.
- The students shall also submit a detailed report based on activities done in an internship and learnings through the same.
- The students shall also submit the duly signed internship certificate from the organization/s where internship was done, clearly indicating the period of internship in the certificate.

Walchand College of Engineering, Sangli

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AY 2024-25

Course Information

Programme	M. Tech. Civil (Environmental Engineering)
Class, Semester	Second Year M. Tech., Semester IV
Course Code	
Course Name	Techno-Socio Activity
Desired Requisites:	-

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	-	-	100	100
Practical	2 Hrs./Week				
Interaction	-	**Credits: 1**			

Course Objectives

1	Develop skills like teamwork, and communication through technical contribution on socio-economic issues
2	Enhance understanding of the socio-economic impact of engineering projects and technology on society.
3	Apply engineering knowledge and problem-solving skills to address real-world challenges

Course Outcomes (CO)

At the end of the course, the students will be able to,

CO	Description	Blooms Taxonomy	
		Descriptor	Level
CO1	***Explain*** professional culture/ethics and build proficiency in professional communication, working in teams, decision making and leadership.	Understand Apply	II III
CO2	***Apply*** the technical knowledge through participation in techno-socio assignments.	Apply	III
CO3	***Demonstrate*** ethical quality and social responsibilities through the technical knowledge gained.	Evaluate	V

List of Activities

List of Activities:

1. Involvement in techno-socio activity
   a) Presentation on involvement in techno-socio activity individually/through student clubs during F.Y. & S.Y. M. Tech.
   b) Submission of summary report on these activities.
2. Techno-socio activity (Team Activity)
   a) Organization of a technical activity/event for the benefit of society in a batch.
   b) Submission of report on the organized activity.
3. Submission of certificates/documents required for student port-folio (Participation in Curricular and Extra-Curricular Activities within and outside the campus).

References

1	National Institute for Engineering Ethics (NIEE)
2	Professional ethics, National Society of Professional Engineers (NSPE).

Useful Links

1	https://www.asce.org/pdf/ethics_manual.pdf
2	https://www.aicte-india.org/atal

CO-PO Mapping

	Programme Outcomes (PO)					
	1	2	3	4	5	6
CO1		3			3	
CO2			2		3	
CO3			2		3	

Assessment
The assessment is based on ESE. The panel of minimum two members from the department shall assess the student for the techno-socio activity. The students are expected to present the work done in the four semesters. The students shall also submit a detailed report based on activities done and learnings through the same. The students shall also submit the duly signed certificate from the organization/s, local bodies where activities were carried out.