Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M.Tech. (Structural Engineering)
Class, Semester	M. Tech., Sem. III
Course Code	5ST690
Course Name	Dissertation Phase-I
Desired Requisites:	Courses of Semester I and II of F. Y. M. Tech (Civil-Structures)

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	20 Hrs/week				
Interaction	-	**Credits: 10**			

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 analyze, interpret, debate and classify the findings of the work.

Course Outcomes (CO)	
CO1	Examine research developments through literature survey and set up research hypotheses.
CO2	Construct research methodology to evaluate the research hypothesis
CO3	Critique research idea with perspective scope.

Module Contents

The Project 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-I will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available. End semester presentation should be done along with the report on identification of topic for the work and the methodology 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	1					
CO2	2		2	3		1
CO3	2	3		3	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				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation				
Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities,	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, Considering a 26-week semester. The actual schedule shall be as per academic calendar. 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. The experimental lab shall have typically 8-10 experiments.				

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AY 2021-22

Course Information	
Programme	M.Tech. (Structural Engineering)
Class, Semester	Second year M. Tech., Sem. III
Course Code	5ST612
Course Name	Design Optimization (PE5)
Desired Requisites:	Engineering Mathematics, Structural Analysis and Design

Teaching Scheme		**Examination Scheme (Marks)**				
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**		**Total**
Tutorial	-	20	20	60		100
Practical	-					
Interaction	-	**Credits: 2**				

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 structural and other engineering fields.
3	To provide exposure to modern techniques of global optimization for design optimization of Processes/Designs in engineering field in general and structural engineering.

Course Outcomes (CO)	
CO1	**Apply** various optimization techniques for the solution of linear, nonlinear and general optimization problems.
CO2	**Analyze** various optimization problems in the engineering field.
CO3	**Create** optimized global engineering designs of structural and other engineering facilities having different complexity.

Module	Module Contents	Hours
I	**Classical Optimization Techniques** Relevance and Significance of optimization, Various optimization problems in different fields of engineering, Introduction to optimization theory-objective function/design variables/constraints, Classification of optimization problems and optimization techniques, Formulation of Various optimization problems, linear programming and simplex algorithm, Nonlinear programming by Lagrange Multiplier with equality and inequality constraints.	5
II	**Optimization of Trusses and Structural Components** Minimum weight criteria, fully stressed design and displacement constraints, optimization of truss, cable and arch structures, optimization of beams and columns.	5
III	**Constrained Optimization and Multi-Objective Optimization** Optimality criterion methods. Sequential Quadratic Programming, Penalty Methods, Sensitivity of optimum solution, Aspects of Multi-objective optimizations, Multi-objective optimization techniques.	5
IV	**Optimization by Stochastic and Heuristic 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.	5
V	**Optimization by Stochastic and Heuristic Algorithms II** *Simulated annealing*, Procedure, Algorithm, Features of the Method, Optimization solutions. *Response surface methodology*, Three-level factorial design, Box–Behnken design, Central composite design, Doehlert design, Desirability function, Examples.	5
VI	**Optimization by Evolutionary and Fuzzy Algorithms** *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.	5

Text Books	
1	Singiresu S. Rao, “Engineering Optimization-Theory and Practice”, New Age International Publishers, 2013, 4th Edition.
2	Uri Kirsh, “Optimum Structural Design”, McGraw Hill, 1988.
3	R. Fletcher, “Practical Optimization”, John Wiley & Sons, New York, 2nd Edition, 1987.

References	
1	Edgar, Himmelblau and Lasdon, “Optimization of Chemical ProcessesMc”, Graw Hill International Edition, 2nd Edition, 2001.
2	M.S. Bazaraa, H.D. Sherali and C. Shetty, “Nonlinear Programming-Theory and Algorithms”, John Wiley and Sons, New York, 1993.

3	Richard Vinter, “Optimal Control”, Springer, 2010.
4	Du, Ke-Lin, Swamy, M. N. S., “Search and Optimization by Metaheuristics”, Birkhäuser Basel-Springer International, 1st Edition, 2016
Useful Links	
1	https://nptel.ac.in/courses/105/108/105108127/
2	https://nptel.ac.in/courses/103/103/103103164/

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2					2
CO2			2	3		1
CO3	1			3		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 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3,4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom’s Taxonomy Level				
Bloom’s Taxonomy Level	**T1**	**T2**	**ESE**	**Total**
Remember				
Understand				
Apply	10	10	10	**30**
Analyze	5	10	15	**30**
Evaluate	5		15	**20**
Create			20	**20**
Total	20	20	60	

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Course Information	
Programme	M.Tech. (Structural Engineering)
Class, Semester	First year M. Tech., Sem. III
Course Code	5ST613
Course Name	Advanced Prestressed Concrete (PE5)
Desired Requisites:	Design of Concrete Structures

Teaching Scheme		**Examination Scheme (Marks)**				
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**		**Total**
Tutorial	-	20	20	60		100
Practical	-					
Interaction	-	**Credits: 2**				

Course Objectives	
1	To illustrate basic concepts and systems of prestressing.
2	To impart knowledge of Prestressed concrete structures.
3	To provide knowledge for design of Prestressed concrete structures using relevant IS codes.

Course Outcomes (CO)	
CO1	**Estimate** losses of prestress due to various causes.
CO2	**Verify** appropriate section using flexure, shear, torsional design approach for Prestressed concrete structures
CO3	**Design** Prestressed concrete components and structures.

Module	Module Contents	Hours
I	**Introduction** Basics of pre-stressed concrete, stress concept, strength concept and load balancing concept, systems of prestressing, loss of prestress, Material properties: steel, allowable stresses, relaxation, fatigue. Stages of prestressing.	5
II	**Analysis of Sections under flexure** Analysis of rectangular sections under flexure at ultimate loads: equations of equilibrium and compatibility and constitutive models, stress block for concrete, solution procedure, minimum and maximum amount of prestressed reinforcement. Analysis of flanged sections under flexure at ultimate loads. Introduction of software for prestressed sections.	5
III	**Design of Section- Limit state method** Design of Prestressed concrete beams and slabs, rectangular and I Sections. choice of cross section: flexural efficiency; determination of limiting zone; post-tension in stress. Magnel's graphical method. Design based on ultimate loads. Detailing requirement. Thermal stresses in prestressed slab.	5
IV	**Shear and Torsion** Analysis and Design for shear and torsion, Analysis for shear: principal stress trajectories of linear elastic beams crack patterns, modes of failure, component of shear resistance. Capacity for web shear cracking capacity for flexural shear cracking. Design of shear reinforcement detailing requirements, design steps. Analysis for torsion behavior of linear elastic beams, crack pattern. Modes of failure, components of torsion resistance.	5
V	**Design of anchorage zone** Calculations for deflection and crack-width, Pretensioned members: Hoyer effect, transmission length, bond length, development length, transverse tensile stresses, end zone reinforcement. Post-tensioned members: Bursting force, anchorage zone reinforcement, bearing stress, design of end block. Circular Prestressing design.	5
VI	**Design of continuous beams** Cantilever beams and Continuous beams, Cantilever beams: choice of cable profile, determination of limiting zone. Continuous beams: advantages and disadvantages, choice of cable profile, analysis for bending moment. Principle of linear transformation, principle of concordant cable.	5

Text Books	
1	Krishna Raju N., "Prestressed Concrete", McGraw Hill Education (ISE Editions); 5th Edition 2014.
2	Ramamruth S. "Design of reinforced concrete structures", Dhanpatrai publishing company, 17th Edition 2010.

3	Nagarajan Praveen, “Prestressed concrete designs”, Pearson publications, 2013
References	
1	Lin T. Y. and Burns N. H. “Design of Prestressed concrete structures”, Wiley publications, 3rd Edition, 2010.
2	Arthur H. Nilson, “Design of Prestressed concrete”, John Wiley publications, 2nd Edition.
3	IS: 1343 Indian standard code of practice for Prestressed concrete BIS New Delhi
Useful Links	
1	https://nptel.ac.in/courses/105/106/105106117/
2	https://www.youtube.com/watch?v=4KYPltsNAWs

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	1			2		1
CO2	2		3	2		2
CO3	2		3	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 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3,4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.						

Assessment Plan based on Bloom’s Taxonomy Level				
Bloom’s Taxonomy Level	**T1**	**T2**	**ESE**	**Total**
Remember				
Understand				
Apply	10	10	10	**30**
Analyze	5	10	15	**30**
Evaluate	5		15	**20**
Create			20	**20**
Total	**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)						
AY 2021-22						
Course Information						
Programme	M. Tech. (Structural Engineering)					
Class, Semester	Second year M. Tech., Sem. III					
Course Code	5ST614					
Course Name	Advances in Concrete Composites (PE5)					
Desired Requisites:	Concrete technology					
Teaching Scheme		**Examination Scheme (Marks)**				
Lecture	**2**	**T1**	**T2**	**ESE**		**Total**
Tutorial	**-**	**20**	**20**	**60**		**100**
Practical	**-**					
Interaction	**-**	**Credits:2**				

Course Objectives	
1	To impart knowledge of various concrete composites used in practice
2	To demonstrate variations in strength of concrete composites
3	To provide knowledge of various advanced types of concrete in modern construction industry.

Course Outcomes (CO)	
CO1	Demonstrate engineering properties, behavior and applications of FRC and Ferro cement.
CO2	Differentiate applications of silica fume concrete and polymer concrete by knowing their properties.
CO3	Relate importance of light weight and high strength concrete in modern constructions.

Module	**Module Contents**	**Hours**
I	**Fiber Reinforced Concrete** Introduction, Properties of constituent materials, Mix proportion, mixing, casting methods, properties of freshly mixed concrete (fiber reinforced concrete), workability tests, mechanical properties, behavior of fiber reinforced concrete under compression, tension flexure, research findings, and application of fiber reinforced concrete.	5
II	**Ferro Cement concrete** Introduction, materials used, mechanical properties, construction techniques, design in direct tension, applications, and merits as structural materials	5
III	**Silica Fume Concrete** Introduction, physical and chemical properties of silica Hume, reaction	5

	mechanism of silica fume, properties of silica fume concrete in fresh state, mechanical properties and durability of silica fume concrete.	
IV	**Polymer Concrete** Introduction, classification, properties of constituent materials, polymer impregnated concrete, polymer concrete, application.	5
V	**Lightweight Concrete** Introduction, classification, properties of constituent materials, artificial aggregates, application.	5
VI	**High Strength Concrete** Introduction, properties of constituent materials, Mix Design, application.	5

Text Books	
1	Rafat Siddique, "Special Structural Concretes", Galgotia Publication Private Ltd.,2000

References	
1	R. N. Swamy, "Concrete Technology & Design", Surrey University Press., illustrated, 1984.
2	P.N. Balaguru, S.P. Shah, "Fiber Reinforced Cement Composites, McGraw Hill., illustrated, 1992.
3	D. J. Hannant, "Fiber Cement and Fiber Concrete", John Wiley & Sons.illustrated,1978

Useful Links	
1	NPTEL :: Civil Engineering - Concrete Engineering and Technology
2	NPTEL :: Civil Engineering - NOC:Advanced Concrete Technology
3	NPTEL :: Metallurgy and Material Science - NOC:Theory and Practice of Non Destructive Testing
4	Module 12 (nptel.ac.in)

-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	3					
CO2		2		3	2	
CO3		3		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 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3,4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level				
Bloom's Taxonomy Level	**T1**	**T2**	**ESE**	**Total**
Remember				
Understand				
Apply	10	10	10	**30**
Analyze	5	10	15	**30**
Evaluate	5		15	**20**
Create			20	**20**
Total	**20**	**20**	**60**	**100**

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Course Information	
Programme	M.Tech. (Structural Engineering)
Class, Semester	Second yearM. Tech., Sem. III
Course Code	5ST652
Course Name	Activity Based Lab - Optimization Technique for Numerical Simulation
Desired Requisites:	Engineering Mathematics, Structural Analysis and Design

Teaching Scheme		**Examination Scheme (Marks)**				
Lecture		**LA1**	**LA2**	**ESE**	**-**	**Total**
Tutorial	-	30	30	40	-	100
Practical	2 Hrs/week					
Interaction	-	**Credits: 1**				

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 structural and other engineering fields.
3	To provide exposure to modern techniques of global optimization for design optimization of Processes/Designs in engineering field in general and structural engineering.

Course Outcomes (CO)	
CO1	**Apply** various optimization techniques for the solution of linear, nonlinear and general optimization problems.
CO2	**Analyze** various optimization problems in the engineering field.
CO3	**Create** optimized global engineering designs of structural and other engineering facilities having different complexity.

Module Contents

Students will be asked to work upon a minimum **four** of the following topics during the semester. They will submit the report of each topic containing the information (as per need of topic) like: introduction, general information, usage/application (if any) detailed description of work/process, relevant diagrams, drawings & tabulation (if any), observation and results (as applicable) or any other relevant information as per topic.

i) Solve simple optimisation problem by standard method using EXCEL/Programming
ii) Solve TRUSS Optimization using optimality criteria using EXCEL/Programming
iii) Implement GA for structural optimization using EXCEL/Programming//relevant software
iv) Implement Simulated Annealing/Ant colony Optimization for structural optimization using EXCEL/Programming/relevant software.
v) Implement fuzzy optimization for structural optimization using EXCEL/Programming/relevant software

Text Books

1	Singiresu S. Rao, “Engineering Optimization-Theory and Practice”, New Age International Publishers, 2013, 4th Edition.
2	Uri Kirsh, “Optimum Structural Design”, McGraw Hill, 1988.

3	R. Fletcher, “Practical Optimization”, John Wiley & Sons, New York, 2nd Edition, 1987.
References	
1	Edgar, Himmelblau and Lasdon, “Optimization of Chemical ProcessesMc”, Graw Hill International Edition, 2nd Edition, 2001.
2	M.S. Bazaraa, H.D. Sherali and C. Shetty, “Non-Linear Programming-Theory and Algorithms”, John Wiley and Sons, New York, 1993.
3	Richard Vinter, “Optimal Control”, Springer, 2010.
4	Du, Ke-Lin, Swamy, M. N. S., “Search and Optimization by Metaheuristics”, Birkhäuser Basel-Springer International, 1st Edition, 2016
Useful Links	
1	https://nptel.ac.in/courses/105/108/105108127/
2	https://nptel.ac.in/courses/103/103/103103164/

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

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation

Assessment	Based on	Conducted by	Typical Schedule (for 26 week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities,	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, Considering a 26-week semester. The actual schedule shall be as per academic calendar. 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. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based on Bloom’s Taxonomy Level					
Bloom’s Taxonomy Level	**LA1**	**LA2**	**ESE**	**-**	**Total**
Remember					
Understand	10				**10**

Apply	20	20	20		**60**
Analyze		10	10		**20**
Evaluate			10		**10**
Create					
Total	**30**	**30**	**40**		**100**

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AY 2021-22

Course Information

Programme	M.Tech. (Structural Engineering)
Class, Semester	Second year M. Tech., Sem. III
Course Code	5ST653
Course Name	Activity based Lab - Design of Prestressed components
Desired Requisites:	Advanced design of reinforced concrete structure

Teaching Scheme		**Examination Scheme (Marks)**				
Lecture		**LA1**	**LA2**	**ESE**	**-**	**Total**
Tutorial	-	30	30	40	-	100
Practical	2 Hrs/week					
Interaction	-	**Credits: 1**				

Course Objectives

1	To illustrate basic concepts and systems of prestressing.
2	To impart knowledge of Prestressed concrete structures.
3	To provide knowledge for design of Prestressed concrete structures using relevant IS codes.

Course Outcomes (CO)

CO1	**Estimate** losses of prestress due to various causes.
CO2	**Verify** appropriate section using flexure, shear, torsional design approach for Prestressed concrete structures
CO3	**Design** Prestressed concrete components and structures.

Module Contents

Students will be asked to work upon **minimum two** of the following topics during the semester. They will submit the report of each topic containing the information (as per need of topic) like: introduction, general information, usage/application (if any) detailed description of work/process, relevant diagrams, drawings & tabulation (if any), observation and results (as applicable) or any other relevant information as per topic.

vi) Analysis and design of PT slab
vii) Analyse and design 3-D building with prestressed elements in relevant software
viii) Design of anchor zone
ix) Visit to ongoing commercial complex, study in detail about analysis and design of various prestressed elements.

Text Books

1	Krishna Raju N., "Prestressed Concrete", McGraw Hill Education (ISE Editions); 5th Edition 2014.

2	Ramamruth S. “Design of reinforced concrete structures”, Dhanpatrai publishing company, 17th Edition 2010.
3	Nagarajan Praveen, “Prestressed concrete designs”, Pearson publications, 2013
References	
1	Lin T. Y. and Burns N. H. “Design of Prestressed concrete structures”, Wiley publications, 3rd Edition, 2010.
2	Arthur H. Nilson, “Design of Prestressed Concrete”, John Wiley publications, 2nd Edition.
3	IS: 1343 Indian standard code of practice for Prestressed concrete BIS New Delhi
Useful Links	
1	https://nptel.ac.in/courses/105/106/105106117/
2	https://www.youtube.com/watch?v=4KYPltsNAWs

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

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation

Assessment	Based on	Conducted by	Typical Schedule (for 26 week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities,	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, Considering a 26-week semester. The actual schedule shall be as per academic calendar. 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. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based on Bloom's Taxonomy Level					
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**-**	**Total**
Remember					
Understand	10				**10**
Apply	20	20	20		**60**
Analyze		10	10		**20**
Evaluate			10		**10**
Create					
Total	**30**	**30**	**40**		**100**

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*

AY 2021-22

Course Information

Programme	M.Tech. (Structural Engineering)
Class, Semester	First year M. Tech., Sem. III
Course Code	5ST654
Course Name	Activity Based Lab- Advances in concrete composites
Desired Requisites:	Concrete Technology

Teaching Scheme		**Examination Scheme (Marks)**				
Lecture	-	**LA1**	**LA2**	**ESE**	**-**	**Total**
Tutorial	-	30	30	40	-	100
Practical	-					
Interaction	2 Hrs/week	**Credits: 1**				

Course Objectives

1	To impart knowledge of various concrete composites used in practice
2	To demonstrate variations in strength of concrete composites
3	To provide knowledge of various advanced types of concrete in the modern construction industry.

Course Outcomes (CO)

CO1	Demonstrate engineering properties, behavior and applications of FRC and Ferro cement.
CO2	Differentiate applications of silica fume concrete and polymer concrete by knowing their properties.
CO3	Relate importance of light weight and high strength concrete in modern constructions.

Module Contents
Students will be asked to visit the construction industry and interact with engineers regarding various concrete composites present. They should prepare a detailed report mentioning specific benefits of using the composites. They will submit the report of topic containing the information (as per need of topic) like: introduction, general information, usage/application (if any) detailed description of work/process, relevant diagrams, drawings & tabulation (if any), observation and results (as applicable) or any other relevant information as per topic, mix design etc. At the end of the semester, the work completed will be assessed based on the report and presentation.

CO-PO Mapping

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

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation

Assessment	Based on	Conducted by	Typical Schedule (for 26 week Sem)	Marks
	Lab activities,	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the	

LA1	attendance, journal		end of Week 6	30
LA2	Lab activities,	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, Considering a 26-week semester. The actual schedule shall be as per academic calendar. 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. The experimental lab shall have typically 8-10 experiments.				

Assessment Plan based on Bloom's Taxonomy Level					
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**-**	**Total**
Remember					
Understand	10				**10**
Apply	20	20	20		**60**
Analyze		10	10		**20**
Evaluate			10		**10**
Create					
Total	**30**	**30**	**40**		**100**

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*	
AY 2021-22	
Course Information	
Programme	M.Tech. (Structural Engineering)
Class, Semester	M. Tech., Sem. IV
Course Code	5ST691
Course Name	Dissertation Phase-II
Desired Requisites:	Courses of Semester I and II of F. Y. M. Tech (Civil-Structures)
Teaching Scheme	
Lecture	---
Tutorial	--

Practical	24
Interaction	--
Credits:	12

Course Objectives	
1	To analyze / experiment selected research problem further.
2	To review, classify and consolidate observations / results based on the detail analytical / experimental work.
3	To document the research work in the prescribed format and present it effectively.
Course Outcomes (CO)	
CO1	Apply appropriate techniques and tools to solve complex structural problems.
CO2	Demonstrate professional ethics and work culture.
CO3	Exhibit good communication skill to the engineering community and society.
CO4	Show contribution in efficient technology transfer to the society.

Module Contents

Dissertation – II will be related to work on the topic identified in Dissertation – I. Mid semester presentation, Continuous assessment. There will be pre submission seminar at the end of academic term. After the approval the student has to submit the detail report. Continuous assessment of Dissertation – I and Dissertation – II will be monitored by the departmental committee.

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	1					1
CO2					3	1
CO3	1	3				1
CO4			2	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

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation

Assessment	Based on	Conducted by	Typical Schedule (for 26 week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
	Lab activities,	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the	

LA2			end of Week 12	30
Lab ESE	Attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, Considering a 26-week semester. The actual schedule shall be as per academic calendar. 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. The experimental lab shall have typically 8-10 experiments.				

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Course Information

Programme	M.Tech. (Structural Engineering)
Class, Semester	Second year M. Tech., Sem. IV
Course Code	5ST622
Course Name	Design of Tall Structures (PE6)
Desired Requisites:	Solid Mechanics, Structural analysis, Structural Mechanics

Teaching Scheme		**Examination Scheme (Marks)**				
Lecture	3Hrs/week	**T1**	**T2**	**ESE**		**Total**
Tutorial	-	20	20	60		100
Practical	-					
Interaction	-	**Credits: 3**				

Course Objectives

1	Able to analyze and understand the design concept of special structures.
2	Familiar to different design codes & their applications in high rise structures.
3	Exposed to real projects /data application and structural detailing.
4	At the end of this course the student should have understood the problems associated with large heights of structures with respect to loads (wind and earthquake and deflections of the structure).

Course Outcomes (CO)

CO1	**Apply** advanced methods for analysis of structures.
CO2	**Calculate** forces and displacements for tall structures under lateral loads
CO3	**Design** various structural systems for stability analysis of tall structures

Module	**Module Contents**	**Hours**
I	**Introduction** The Tall Building in the Urban Context. General Planning Considerations. Various loads like dead load, live load, wind and seismic Load, construction loads -snow, rain and ice loads. Water and earth pressure loads, loads due to restrained volume changes of material. Impact and dynamic loads, blast loads. IS 16700-2017, Impact of the gravity load and lateral load resisting system.	7
II	**Structural systems** Dispersion of vertical and lateral forces, load path, optimum ground level space.	7

	Lateral load resisting systems- shear wall, bracings, outrigger, core wall system, belt truss system. Composite floor systems, multi-storey box systems.	
III	**Common high-rise building structures and their behaviour under load** The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems-Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift Efficient Building Forms - The Counteracting Force or Dynamic Response. Wind acceleration and human comfort.	6
IV	**Approximate structural analysis and design of buildings** Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading - Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings- Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure. Effect of creep on serviceability.	8
V	**Other high-rise building structure** Deep - Beam Systems -High-Rise Suspension Systems - Pneumatic High -Rise Buildings - Space Frame applied to high - Rise Buildings - Capsule Architecture. Introduction to parametric analysis and design.	6
VI	**Foundation design for varied soil strata** Type of foundations, Structural behaviour of deep foundation	6

Text Books	
1	Wolfgang Schueller" High - rise building Structures", John Wiley and Sons.
2	Bryan Stafford Smith and Alex Coull, " Tall Building Structures ", Analysis and Design, John Wiley and Sons, Inc., 1991.
3	Taranath S, " Structural Analysis and Design of Tall Buildings", McGraw Hill International edition.

References	
1	Coull, a. and Smith, Stafford, b. " Tall Buildings ", Pergamon Press, London, 1997.
2	Lin T.Y. and Burry D. Stotes, " Structural Concepts and Systems for Architects and Engineers ", John Wiley1994.
3	Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.
4	Manohar S.N, " Tall Chimneys", Tata McGraw Hill Publishing Company, New Delhi

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_ar10/preview
2	https://www.youtube.com/watch?v=XCun_ewg-I8
3	https://lecturenotes.in/s/1566-tall-building/videos

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2		2			2
CO2			2	3		2
CO3	1		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 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3,4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level				
Bloom's Taxonomy Level	**T1**	**T2**	**ESE**	**Total**
Remember				
Understand				
Apply	10	10	10	**30**
Analyze	5	10	15	**30**
Evaluate	5		15	**20**
Create			20	**20**
Total	**20**	**20**	**60**	**100**

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Course Information	
Programme	M.Tech. (Structural Engineering)
Class, Semester	Second Year M. Tech., Sem. IV
Course Code	5ST671
Course Name	Techno Socio Activity
Desired Requisites:	No Requisite Course is required.

Teaching Scheme		**Examination Scheme (Marks)**				
Lecture		LA1	LA2	ESE		**Total**
Tutorial	-	30	30	40	-	100
Practical	-					
Interaction	01 Hr./week	**Credits: 1**				

Course Objectives	
1	To promote / motivate the students for co-curricular activity
2	To develop the ability of "Out of Box" thinking.
3	To apply the knowledge acquired in engineering to solve nationwide, society and community problem.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	**Apply** the technical knowledge to solve the social problem	Applying

CO2	**Analyse** the real world problems	Analysing
CO3	**Demonstrate** the solution to techno socio problem	Evaluating
	Module Contents Open to students. Student can undertake any three techno-socio activity as listed below but not limited to it :	**Hours**
I	Each student or group of students may participate in any social activity like "Swach Bharat Abhiyan", "Blood Donation Camp", or any social activity announced by Govt. / Corporation / Panchayat.	12-13 Hrs
II	Each student or group of students participating in technical events / competition.	
III	Awards / recognition received in techno-socio activity	
IV	Completing the on line courses (on topics beyond syllabus) / certification of any companies / technologies (e.g. Coursera /CSIR/IIRS- Outreach Programme/ AICTE-ATAL Course /Sky-fi lab / SWAYAM / NPTEL .)	
V	Developing any innovative Patent /gadget / solution / system and transfer in the interest of Nation / Society / Institute (WCE)	
VI	Published a papers in national / international conferences / journals	
VII	Coordinating the students clubs / services	
VIII	Organizing techno-socio activity for the students / community in rural areas, backward areas.	
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	
3	https://nptel.ac.in/	
4	https://swayam.gov.in/	

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2				3	2
CO2					3	2
CO3	1				3	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				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation				
Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30

LA2	Lab activities,	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, Considering a 26-week semester. The actual schedule shall be as per academic calendar. 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. The experimental lab shall have typically 8-10 experiments.				

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Course Information

Programme	M. Tech. (Structural Engineering)
Class, Semester	Second year M. Tech., Sem. III
Course Code	5ST614
Course Name	Legal, Financial Aspects of Industrial Project
Desired Requisites:	--

Teaching Scheme		**Examination Scheme (Marks)**				
Lecture	2	**T1**	**T2**	**ESE**		**Total**
Tutorial	-	20	20	60		100
Practical	-					
Interaction	-	**Credits:2**				

Module	**Module Contents**	**Hours**
I	**Economic Decision Making** Introduction, Mathematics of Time Value of Money: Compound Interest, Cash Flow Diagram, Uniform Annual Series, Irregular Cash Flows, Cost Comparison: Present Worth Analysis, Annual Cost Analysis, Capitalized Cost Analysis	4
II	**Taxes and Profitability** Taxes, Profitability Of Investments: Rate of Return, Payback Period, Net Present Worth, Internal Rate of Return, Inflation, Sensitivity and Break-Even Analysis, Uncertainty in Economic Analysis	4
III	**Factories Act, 1948:** Health, Safety, Provisions relating to Hazardous Processes, Welfare, Working Hours of Adults, Employment of young persons, Annual Leave with wages. The Employees Provident Fund and Miscellaneous Provisions Act, 1952.	4

IV	**Constitution and Labour Laws:** Labour laws, Equality before law and its application in Labour Laws, Equal pay for equal work; and Article-16 and reservation policies, Articles 19, 21, 23 and 24 and its implications.	4
V	**Environmental Policies and Clearance** Environmental Policies-National and international; international treaties. Climate change Protocols and Conventions, Carbon emission management, Clean Development Mechanism (CDM), carbon neutrality. Environmental Clearance; Forest clearance; Consent to Establish & Consent to Operate; Environmental conservation plan for endangered flora and fauna;	3
VI	**Environmental Legislation** Environmental Protection Act 1986, Air (Prevention and Control of pollution) Act, Water (Prevention and Control of pollution) Act, Mines and Mineral Act, Factories Act, Pesticides Act, Indian Forest Act, Wildlife Act, Ancient Monuments and Archaeological Sites and Remains Act, Hazardous Waste Management and Handling Rules / Biomedical Rules / Solid Waste Management Rules, Environment Tribunal Act, MOEF Guidelines and Notifications, Appellate Authority Act, Other related Notifications	5

Text Books

1. P.L. Mehta, Managerial Economics Analysis, Problems and cases, S. Chand & Co. Ltd., 2001
2. Dieter G.E., Engineering Design, McGraw-Hill Education 5th edition, 2012.
3. N. Godbole, S. Belapure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley India Pvt. Ltd.
4. Canter, L. W., Environmental Impact Assessment, McGraw-Hill, 2nd Edition, 1997.
5. "Environmental Auditing", Published by CPCB, Govt. of India Publication, New Delhi.

References

1. R Peterson and Lewis: Managerial Economics, 4th Ed., Prentice Hall , 2004
2. R. Drefuss, J. Pila; The Oxford Handbook of Intellectual Property Law, Oxford University Press, 2018.
3. Adv. P. Mali, Cyber Law & Cyber Crimes Simplified, Cyber Infomedia, 2017.
4. No.29 of 1986, [23/5/1986] - The Environment (Protection) Act, 1986, amended 1991
5. G.S.R.830(E), [24/11/2011] - The Water (Prevention and Control of Pollution) Amendment Rules, 2011.
6. No.14 of 1981, [29/3/1981] - The Air (Prevention and Control of Pollution) Act 1981, amended 1987

Assessment Plan based on Bloom's Taxonomy Level				
Bloom's Taxonomy Level	**T1**	**T2**	**ESE**	**Total**
Remember				
Understand				

Apply	10	10	10	**30**
Analyze	5	10	15	**30**
Evaluate	5		15	**20**
Create			20	**20**
Total	**20**	**20**	**60**	**100**