Government College of Engineering, Karad
(An Autonomous Institute of Government of Maharashtra)
Syllabus as per AICTE guidelines
F. Y. M. Tech.   Civil -Structural Engineering
Semester I

S. No.	Course Type	Code	Course Name	L	P	Contact hours/ w	Credits	EXAM SCHEME				
								CT1	CT2	TA/ CA	ESE	Total
1	PCC	SE1101	Theory of Elasticity & Plasticity	3	-	3	3	15	15	10	60	100
2	PCC	SE1102	Mechanics Of Structure	3	-	3	3	15	15	10	60	100
3	PEC	SE11*3	Programme Elective Course I	3	-	3	3	15	15	10	60	100
4	PEC	SE11*4	Programme Elective Course II	3		3	3	15	15	10	60	100
5	MLC	RM 1105	Research Methodology and IPR	2		2	2	15	15	10	60	100
6	Core Lab	SE1106	Structural Design Lab I	-	8	8	4	-	-	50	50	100
7	OEC	OE11*8	Open Elective Course	3	-	3	3	15	15	10	60	100
8	Audit	AU11*9	Audit Course I	2	-	2	0	-	-	-	-	-
	Total			19	8	27	21	90	90	110	410	700

L- Lecture   P-Practical

CT1- Class Test 1   TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2   ESE- End Semester Examination (For Laboratory: End Semester Performance)

*- Program Elective- I and II, Audit Course I, Open Elective list is provided at the end of structure.

Head

Applied mechanics Department

Government College of Engineering, Karad
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Syllabus as per AICTE guidelines
F. Y. M. Tech. Civil -Structural Engineering
Semester II

S. No	Course Type	Code	Course Name	L	P	Contact hours/week	Credits	CT1	CT2	TA/CA	ESE	Total
1	PCC	SE1201	Theory of Plates and Shells	3	-	3	3	15	15	10	60	100
2	PCC	SE1202	Advanced Design of Steel Structures	3	-	3	3	15	15	10	60	100
3	PEC	SE12*3	Programme Elective Course III	3	-	3	3	15	15	10	60	100
4	PEC	SE12*4	Programme Elective Course IV	3		3	3	15	15	10	60	100
5	PEC	SE12*5	Programme Elective Course V	3		3	3	15	15	10	60	100
6	Audit	SE12*6	Audit Course II	2	-	2	0	-	-	--	-	-
7	Core/IT	SE1207	Mini Project/Industrial Training/ Seminar	-	4	4	2	-	-	50	50	100
8	Core Lab	SE1208	Structural Design Lab II		8	8	4			50	50	100
			Total	17	12	29	21	90	90	150	400	700

L- Lecture   P-Practical

CT1- Class Test 1   TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2   ESE- End Semester Examination (For Laboratory: End Semester Performance)

*- Program Elective- III, IV and V, Audit Course II list is provided at the end of structure

Head

Applied mechanics Department

Government College of Engineering, Karad
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Syllabus as per AICTE guidelines
F. Y. M. Tech. Civil -Structural Engineering
Semester III

S. No.	Course code	Course Name	L	P	Contact hours/w	Credits	EXAM SCHEME		
							CA	ESE	Total
1	SE1301	Dissertation Phase I	-	14	14	07	100*	100	200
2	SE1302 **	MOOC online course (8-12 weeks)	-	-	-	03	-	-	-
		Total	-	14	14	10	100	100	200

Semester IV

S. No.	Course code	Course Name	L	P	Contact hours/w	Credits	EXAM SCHEME		
							TA/CA	ESE	Total
1	SE1401	Dissertation Phase II	-	32	32	16	100*	200	300
		Total	-	32	32	16	100	200	300

CT1- Class Test 1   TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2   ESE- End Semester Examination (For Laboratory: End Semester Performance)

*For Dissertation Phase-I & II, CA is based on the performance in presentation showing progress of the Dissertation work.

** SE1302 is mandatory and will be decided by respective Guide in consultation with Programme Head.

Head

Applied mechanics Department

Government College of Engineering, Karad
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Syllabus as per AICTE guidelines
F. Y. M. Tech. Civil -Structural Engineering

List of Electives

Program Elective I	Program Elective II	Program Elective III	Program Elective IV	Program Elective V
Semester - I	Semester - I	Semester - II	Semester - II	Semester – II
SE1113: Advanced Design of Concrete Structures	**SE1114:** Structural Dynamics	**SE1213:** Earthquake Engineering	**SE1214:** Design of R. C. Bridges	**SE1215:** Finite Element Method
SE1123: Advances in Concrete Composites	**SE1124:** Analytical and Numerical methods for Structural Engineering.s	**SE1223:** Advanced Design of Foundations	**SE1224:** Repairs and Rehabilitation of Structures	**SE1225:** . Fracture Mechanics
SE1133I: Design of Pre stressed Concrete Structures	**SE11134:** Stability of Structures	**SE1233:** Soil Structure Interaction	**SE1234:** Structural Health Monitoring	**SE1235:** Design of High Rise Structures

`	Audit Course II	Open Elective
Semester – I	Semester – II	Semester - I
AU1119: Technical Paper Writing	**AU1219:** Constitution of India	**OE1118:** Business Analytics
AU1129: Disaster Management	**AU1229:** Pedagogy Studies	**OE1128:** Industrial Safety
AU1139: Sanskrit for Technical Knowledge	**AU1239:** Stress Management by Yoga	**OE1138:** Operations Research
AU1149: Value Education	**AU1249:** Personality Development through Life Enlightenment Skills	**OE1148:** Cost Management of Engineering Projects
		OE1158: Composite Materials
		OE1168: Waste to Energy

Government College of Engineering, Karad				
F. Y. M. Tech. Civil -Structural Engineering				
SE1101:Theory of Elasticity and Plasticity				

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1.	Post Graduate should understand elastic behavior of materials.
2.	Post Graduate should understand application of theory of elasticity in plane strain and plain stress conditions, bending, and torsion.
3.	Post Graduate should understand principal stresses in materials.
4.	Post Graduate should understand application of theory of plasticity in practical applications in analysis and design of structures.

Course Contents		**Hours**
Unit 1	Stress & Strain at a point, static indeterminacy of problem of 3-D elasticity, Stress equilibrium equations in rectangular, cylindrical & spherical co- ordinates, Generalized Hooke's Law, rectangular, cylindrical and spherical co-ordinates, Generalized Hooke's Law, Strain compatibility equations, Stress compatibility equations.	5
Unit 2	Applications of theory of elasticity: Plane stress and plane strain problem in 2 D elasticity, Airy's stress function & its applications to beam bending problems.	5
Unit 3	Principal Stresses and strains in 3-D, stress & strain invariants, numerical problems.	5
Unit 4	Torsion: Shafts of circular and non-circular prismatic sections, Venant theory, warping function approach, stress function approach.	5
Unit 5	Plasticity: hydrostatic stresses, deviatoric stresses, invariants of deviatoric stresses, various failure theories, various empirical stress –strain relationships, theories of plastic flow, yield, criteria, von Misses, Tresca yield criteria, strain hardening.	5
Unit 6	Applications of plasticity. Elastic perfectly plastic materials, plane stress- plane strain problems in plasticity, an application to thick cylinders, thick spheres.	5

Tutorials

A set of Tutorial per unit is to be submitted			

Text Books

1.	Theory of Elasticity–S. Timoshenko& J. N. Goodie, McGraw Hill, Singapore. Third Edition 1970, New York
2.	Theory of Elasticity: Filonenko, Borodich, Foreign Language Publication House, 1965, USA.
3.	Theory of Elasticity: Sadhu Sing, Khanna Publishers, Delhi, 2012

Reference Books

1.	Structural Mechanics with Introductions to Elasticity and Plasticity–By Venkatraman, Sharad A. Patel, McGraw-Hill Book Company, New York. 1970
2.	Solid Mechanic - S. M. A. Kazimi, Tata McGraw Hill, New Delhi
3.	Theory of Plasticity – Chakraborty J., Tata McGraw Hill Publishing Company Limited
4.	Theory of Plasticity – R. Hill, Vannastrod, USA
5.	

Useful Links

1.	nptel.iitk.ac.in/
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3.	www.wikipedia.Newton.com/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√		√	√		√	√	√	√	√	
CO 2	√	√	√	√	√	√			√			√	√	√	
CO 3	√	√	√	√				√		√	√				√
CO 4	√	√	√	√		√			√	√	√			√	√

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyse	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

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<tbody>
<tr><td colspan="6" align="center">Government College of Engineering, Karad</td></tr>
<tr><td colspan="6" align="center">F. Y. M. Tech. Civil -Structural Engineering</td></tr>
<tr><td colspan="6" align="center">SE1102 : Mechanics Of Structure</td></tr>
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Teaching Scheme			**Examination Scheme**	
Lectures	03Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	3Hrs

Course Outcomes (CO)

1.	Post Graduate should understand moving load analysis.
2.	Post Graduate should learn analysis of curved members.
3.	Post Graduate should study different types of beams on elastic foundation.
4.	Post Graduate shall force and displacement methods of analysis.

Course Contents		**Hours**
Unit 1	Influence Line Diagrams for Indeterminate Structures: Continuous beams, portal frames & two hinged arches. Muller-Breslau's Principle & Moment distribution method	**(6)**
Unit 2	Beams Curved in Plan: Determinate & Indeterminate beams curved in plan.	**(4)**
Unit 3	Beams on Elastic Foundations: Analysis or infinite, semi-infinite & finite beams	**(5)**
Unit 4	Beam columns: Concept of geometric & material nonlinearity. Governing differential equation, Analysis of beam-columns subjected to different loadings and support conditions. Stiffness and carry-over factors for beam-columns, fixed end actions due to various loads.	**(4)**
Unit 5	Stiffness method of structural analysis, flexibility and stiffness matrices, Analysis of continuous beams, trusses and plane frames by Structure oriented stiffness approach.	**(7)**
Unit 6	Member Oriented Stiffness Method: Stiffness matrices of beam, truss, plane frame grid, pin & rigid jointed space frame elements on member axes. Transformation of matrices on Structure axes. Over-all joint stiffness matrix and nodal load vector, assembly rules. Calculation of member end forces, Bandwidth.	(4)

Text Books

1.	Basic structural Analysis by C.S.Rcddy, Tata McGraw Hill, Delhi
2.	Matrix Analysis of Framed Structures by Gere & Weaver, CBS Publishing, Delhi.

Reference Books

1.	Theory of Elastic Stability by Timoshenko & Gere, East West Press Ltd.
2.	Mechanics of Structures Vol. LII & III by Junnarkar & Shah, Charter Publishing House, Delhi
3.	Advanced Theory of Structures by Vaziram & Ratwani, Khanna Publisher, and Delhi.
4.	Analysis of Structures Vol.11, by Vazirani&Ratwani, Khanna Publisher, Delhi.
5.	Structural Analysis by Negi and Jangid, Tata McGraw Hill, Delhi

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CO 1	√	√	√	√		√	√	√	√	√	√		√	√	√
CO 2	√	√	√		√		√	√	√	√				√	√
CO 3	√	√	√	√	√	√	√	√		√		√	√		
CO 4	√	√	√					√					√	√	√

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyse	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10

Government College of Engineering, Karad

F. Y. M. Tech. Civil -Structural Engineering

SE1113:- Elective –I Advanced Design of Concrete Structure

Teaching Scheme			Examination Scheme	
Lectures	03Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	03Hrs

Course Outcomes (CO)

1	Post Graduate should understand analysis and design of various types of slabs as per situation and loading conditions.
2	Post Graduate should understand analysis and design of different types of footings as per superstructure and substructure (soil conditions).
3	Post Graduate should understand analysis and design of different types of water tanks as per situation and loading combinations
4	Post Graduate should understand analysis and design of different structures using method of prestressing, study concept of prestressing, its methods and behavior under loading

Course Contents		Hours
Unit 1	Analysis and design of flat slab, grid slab, circular slab.	6
Unit 2	Analysis and design of combined footing & raft foundation	5
Unit 3	Analysis and design of overhead water tank – Rectangular & circular with flat bottom Design of staging for wind & seismic loads	5
Unit 4	Mechanics of pre-stressed concrete, stress concept, strength concept & load balancing concept, high strength material, systems of prestressing, losses of prestress.	5
Unit 5	Design of Prestressed Concrete, beams, box, T& I Sections, Shear, Deflection, Design of End Block, IS code method.	5
Unit 6	Analysis & design of continuous beams, partial prestressing, circular prestressing – pipes.	4

Text Books

1	Reinforced concrete, Limit state design by Ashok K. Jain, New Chand & bros. Roorkee.
2	Advanced Reinforced Concrete design by P.C. Vargese – Prentice Hall of India, Delhi.
3	Advanced Reinforced Concrete design by N. Krishnaraju – CBS Publishers & Distributors, Delhi.
4	Prestrssed Concrete by S. Ramamurtham, DhanpatRai & Sons.
5	Prestrssed Concrete by N. Krishnaraju
6	Prestrssed Concrete by T. Y. Lin.

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CO 1	√	√	√	√	√		√		√	√	√	√	√	√	
CO 2	√	√	√	√		√	√	√	√			√		√	√
CO 3	√	√	√	√	√	√	√	√	√	√	√	√	√		√
CO 4	√	√	√	√	√		√	√			√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad				
F. Y. M. Tech. Civil -Structural Engineering				
SE1123: Elective-I Advances in Concrete Composites				
Teaching Scheme			**Examination Scheme**	
Lectures	03Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA/CA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1.	Students will understand weakness of plain concrete, and understand the latest development in trend in concrete composites
2.	Student will be able understand advanced applications of composite materials.
3.	Student shall understand manufacturing and properties of concrete composites

	Course Contents	**Hours**
Unit 1	Fiber reinforced composites: Introduction to Fiber Reinforced Concrete, types of fibers, properties of fibers. Properties of constituent materials. Mix proportion, fixing, casting.	5
Unit 2	Properties of freshly mixed reinforced concrete (fiber concrete), workability tests, mechanical properties, Mechanics and mechanism of Fiber Reinforced Concrete.	5
Unit 3	Testing of fibre reinforced under compression, flexure, and shear and bending. Various toughness indices. Stress-strain behaviour. Design aspects of reinforced concrete structures with fibers.	5
Unit 4	Ferro cement - Introduction, materials used mechanical properties, construction techniques, design in direct tension, and applications merits as structural materials.	5
Unit 5	Silica Fume Concrete - Introduction, physical and chemical properties of silica physical and chemical properties of silica fume concrete in fresh state, mechanical properties and durability of silica concrete.	5
Unit 6	Polymer Concrete: Introduction, Classification, properties of constituent materials, polymer impregnated concrete, polymer concrete, application.	5

Text Books

1.	Concrete Technology & Design by R N. Swamy, Surrey University Press.
2.	Special Structural Concretes by Rafal Siddiquc, Galgotia pub. Pvt.ltd.
3.	Fiber Reinforced Cement Composites by P. N. Balaguru, S. P. Shah, Mc-Graw hill.

Reference Books

1.	Fiber Cement and Fiber Concrete by D.J Hannant, John Wiley and Sons.
2.	Fracture Mechanics and Structural Concrete by Bhusan L. Karihal.

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CO 2	√	√	√	√	√	√		√	√	√	
CO 3	√	√	√	√	√		√	√		√	

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyse	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

F. Y. M. Tech. Civil -Structural Engineering

SE1133: Elective-I Design of Pre- Stressed Concrete Structures

Teaching Scheme			Examination Scheme	
Lectures	03Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA/CA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1.	Find out losses in the prestressed concrete. Understand the basic aspects of prestressed concrete fundamentals, including pre and post-tensioning processes.
2.	Analyze prestressed concrete deck slab and beam/ girders.
3.	Design prestressed concrete deck slab and beam/ girders.
4	Design of end blocks for prestressed members.

	Course Contents	Hours
Unit 1	**Introduction to prestressed concrete**: types of prestressing, systems and devices, materials, losses in prestress. Analysis of PSC flexural members: basic concepts, stresses at transfer and service loads, ultimate strength in flexure, code provisions.	5
Unit 2	**Statically determinate PSC beams**: design for ultimate and serviceability limit states for flexure, analysis and design for shear and torsion, code provisions.	5
Unit 3	**Transmission of prestress**ing pretensioned members; Anchorage zone stresses for posttensioned members.	5
Unit 4	**Statically indeterminate structures** - Analysis and design - continuous beams and frames, choice of cable profile, linear transformation and concordancy.	5
Unit 5	**Composite construction** with precast PSC beams and cast in-situ RC slab - Analysis and design, creep and shrinkage effects. Partial prestressing - principles, analysis and design concepts, crack width calculations	5
Unit 6	**Analysis and design** of prestressed concrete pipes, columns with moments.	5

Text Books

1.	Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House, 1955.
2.	• Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi, 1981.
3.	• Limited State Design of Prestressed Concrete, Guyana Y., Applied Science Publishers, 1972.
4.	• IS: 1343- Code of Practice for Prestressed Concrete
5.	• IRC: 112

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CO 2	√	√	√	√	√	√			√	√	√
CO 3	√	√	√	√	√		√	√		√	

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad		
F. Y. M. Tech. Civil -Structural Engineering		
SE1114: Elective –II Structural Dynamics		

Teaching Scheme			**Examination Scheme**	
Lectures	03Hrs/week		CT – 1	15
Tutorial	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1.	Post Graduate will be able to understand the behavior of structure under dynamic loading.
2.	Post Graduate shall model the structure mathematically.
3.	Post Graduate will understand the physics of the problem.
4.	Post Graduate will be able to understand the design of earthquake resistant structures.

Course Contents		**Hours**
Unit 1	Introduction: Objectives, Importance of Vibration Analysis, Nature of Exciting Forces, Mathematical Modeling of Dynamic Systems.	**(5)**
Unit 2	Single Degree of Freedom System:Free andForced Vibration with and without Damping,Response to Harmonic Loading, Response to General Dynamic Loading using Duhamel'sIntegral, Fourier Analysis for Periodic Loading, State Space Solution for Response.	**(5)**
Unit 3	Numerical Solution to Response using Newmark Method and Wilson Method, NumericalSolution for State Space Response using Direct Integration.	**(5)**
Unit 4	Multiple Degree of Freedom System (Lumped parameter): Two Degree of Freedom System, Multiple Degree of Freedom System, Inverse Iteration Method for Determination of Natural Frequencies and Mode Shapes, Dynamic Response by Modal Superposition Method, Direct Integration of Equation of Motion.	**(5)**
Unit 5	Multiple Degree of Freedom System (Distributed Mass and Load): Single Span Beams, Free And Forced Vibration, Generalized Single Degree of Freedom System.	**(5)**
Unit 6	Special Topics in Structural Dynamics (Concepts only): Dynamic Effects of Wind Loading, Moving Loads, Vibrations caused by Traffic, Blasting and Pile Driving, Foundations for Industrial Machinery, Base Isolation.	**(5)**

Text Books

1.	Dynamics of structures - R.W. Clough and J. Penzine, McGraw-Hill Pubication
2.	Structural Dynamics – Roy Craig, John-Wiley & Sons
3.	Dynamics of Structures – Theory & Application to Earthquake Engineering-A.K. Chopra, Prentice Hall Publications.
4.	Dynamics of Structures – Mukhopadhyay
5.	Structural Dynamics – Mario Paz 6. Elements of Earthquake Engineering by Jaikrishna, A.R. Chandrashekharan, Brijesh Chandra, Standard Publishers Distributors

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CO 2	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
CO 3	√	√	√			√	√		√	√			√		√
CO 4	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad			
F. Y. M. Tech. Civil -Structural Engineering			
SE1124: Elective-II Analytical and Numerical methods for Structural Engineering			

Teaching Scheme			Examination Scheme	
Lectures	03Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA/CA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1.	Solve ordinary and partial differential equations in structural mechanics using numerical methods
2.	Write a program to solve a mathematical problem.

Course Contents		Hours
Unit 1	Error Analysis, Polynomial Approximations and Interpolations, Curve Fitting; Interpolation and extrapolation.	**5**
Unit 2	Solution of Nonlinear Algebraic and Transcendental Equations.	5
Unit 3	Elements of Matrix Algebra: Solution of Systems of Linear Equations, Eigen Value Problems.	5
Unit 4	Numerical Differentiation & Integration: Solution of Ordinary and Partial Differential	5
Unit 5	Finite Difference scheme: Implicit & Explicit scheme.	5
Unit 6	Computer Algorithms: Numerical Solutions for Different Structural Problems, Fuzzy Logic andNeural Network.	5

Text Books and Reference Books

1.	An Introduction to Numerical Analysis, AtkinsonK.E, J. Wiley and Sons, 1989.		
2.	Theory and Problems of Numerical Analysis, Scheid F, McGraw Hill Book Company, (Shaum Series), 1988.		
3.	Introductory Methods of Numerical Analysis, Sastry S. S, Prentice Hall of India, 1998.		

Useful Links

1.	nptel.iitk.ac.in/
2.	www.myeducationkey.com/
3.	www.wikipedia.Newton.com/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11
CO 1	√	√	√			√	√	√	√	√	√
CO 2	√	√	√	√	√	√		√		√	
CO 3	√	√	√	√	√	√		√	√		

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyse	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad			
F. Y. M. Tech. Civil -Structural Engineering			
SE1134: Elective-II Stability of Structures			

Teaching Scheme			Examination Scheme	
Lectures	03Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA/CA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1.	Understand the difference between stability and instability.
2.	Evaluate the structural stability of columns, frames.

Course Contents		Hours
Unit 1	Introduction- concept of stability, static dynamic and energy criterion of stability. Flexibility and stiffness criteria. Snap through & post buckling behavior	4
Unit 2	Stability of columns Critical load for standard boundary conditions, elastically restrained perfect column, effect of transverse shear in buckling, column with geometric imperfections, eccentrically loaded columns, orthogonality of buckling modes, large deformation theory for columns	6
Unit 3	Stability of continuous beams and frames Moment distribution and stiffness method for stability analysis of continuous beams and frames	5
Unit 4	Lateral buckling of beam Differential equations for lateral buckling, lateral buckling of beam in pure bending, lateral buckling of beam subjected to concentrated and uniformly distributed force	5
Unit 5	Inelastic stability of columns Inelastic buckling, double modulus theory, tangent modulus theory, Shanley's theory of inelastic buckling, eccentrically loaded inelastic column	5
Unit 6	Dynamic stability of structure Discrete system, Lagrange-Hamilton formulation for continuous system, stability of continuous system, general method for conservative and non conservative system	5

Text Books and Reference Books

1.	Stability theory of structures- Ashwini Kumar, Tata McGraw-Hill New Delhi	
2.	Principle of structural stability theory- Alexander Chajes, Prentice-hall, Inc., Englewood cliffs, New Jersey	
3.	Theory of elastic stability, Thimoshenko and Gere, McGraw-Hill, international	

Useful Links

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3.	www.wikipedia.Newton.com/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11
CO 1	√	√	√	√	√		√	√		√	√
CO 2	√	√	√	√	√	√	√	√			
CO 3	√	√	√	√	√	√	√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad					
F. Y. M. Tech. Civil -Structural Engineering					
MC 1105: Research Methodology and IPR					

Teaching Scheme			Examination Scheme		
Lectures	02Hrs/week		TA		10
Total Credits	02		CT1		15
			CT2		15
			TOTAL		100
			Duration of ESE		03Hrs

Course Outcomes (CO)

1.	Understand research problem formulation.
2.	Analyze research related information
3.	Follow research ethics
4.	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5.	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Course Contents		Hours
Unit 1	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations	(6)
Unit 2	Effective literature studies approaches, analysis Plagiarism, Research ethics,	(5)
Unit 3	Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment	(5)
Unit 4	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	(5)
Unit 5	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.	(5)
Unit 6	New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	(4)

Text Books and Reference Books

1.	Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2.	Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3.	Ranjit Kumar, 2nd Edition , "Research Methodology: A Step by Step Guide for beginners"
4.	Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5.	Mayall , "Industrial Design", McGraw Hill, 1992.
6.	Niebel , "Product Design", McGraw Hill, 1974.
7.	Asimov , "Introduction to Design", Prentice Hall, 1962.
8.	Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

Useful Links

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√	√	√	√			√	√	√	√	√
CO 2	√	√	√	√		√	√	√	√	√	√	√	√	√	
CO 3	√	√	√	√	√	√	√			√					√
CO 4	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyse	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

F. Y. M. Tech. Civil -Structural Engineering

OE1118: Open Elective- Business Analytics

Teaching Scheme			Audit course	
Lectures	03Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			TOTAL	100

Course Outcomes (CO)

Student will be able to understand

1.	Students will demonstrate knowledge of data analytics.
2.	2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
3.	3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
4.	4. Students will demonstrate the ability to translate data into clear, actionable insights

Course Contents		Hours
Unit 1	Unit1: Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview. 9	**9**
Unit 2	Unit 2: Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology	8
Unit 3	Unit 3: Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.	9
Unit 4	Unit 4: Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Model Curriculum of Engineering & Technology PG Courses [Volume -II] [29] Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.	10
Unit 5	Unit 5: Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.	8
Unit 6	Unit 6: Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.	4

Reference Books

1.	Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2.	Business Analytics by James Evans, persons Education.

Useful Links

1.	nptel.iitk.ac.in/
2.	www.myeducationkey.com/
3.	www.wikipedia.Newton.com/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√	√	√	√		√	√	√	√		
CO 2	√	√		√	√	√			√	√	√	√	√	√	√
CO 3	√	√	√			√	√	√	√	√				√	√
CO 4	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand				
Apply				
Analyze				
Evaluate				
Create				
TOTAL				

Government College of Engineering, Karad				
F. Y. M. Tech. Civil -Structural Engineering				
SE1128: Open Elective - Industrial Safety				

Teaching Scheme			**Audit course**	
Lectures	03Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			TOTAL	100

Course Outcomes (CO)

Student will be able to understand

1.	Property of various composite materials
2.	Manufacturing process of metal and polymer matrix composites
3.	Laminate strength and its failure criteria

	Course Contents	**Hours**
Unit 1	Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc., Safety color codes. Fire prevention and firefighting, equipment and methods.	**5**
Unit 2	Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.	5
Unit 3	Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	5
Unit 4	Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	5
Unit 5	Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance	5

Tutorials				

Text Books				
1.	1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.			
2.	2. Maintenance Engineering, H. P. Garg, S. Chand and Company.			
3.	3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.			

Useful Links				
1.	nptel.iitk.ac.in/			
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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√	√	√	√	√		√	√	√	√	√
CO 2	√	√		√	√			√		√	√			√	√
CO 3	√	√		√	√			√	√	√	√	√	√		
CO 4	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand				
Apply				
Analyze				
Evaluate				
Create				
TOTAL				

Government College of Engineering, Karad					
F. Y. M. Tech. Civil -Structural Engineering					
OE1138: Open Elective : Operations Research					

Teaching Scheme				**Audit course**	
Lectures	03Hrs/week			CT – 1	15
Tutorials	-			CT – 2	15
Total Credits	03			TA	10
				ESE	60
				TOTAL	100

Course Outcomes (CO)

Student will be able to understand

1.	1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
2.	Students should able to apply the concept of non-linear programming.
3.	Students should able to carry out sensitivity analysis.
4	Student should able to model the real world problem and simulate it.

Course Contents		**Hours**
Unit 1	Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models	**5**
Unit 2	Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models	5
Unit 3	Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT	5
Unit 4	Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.	5
Unit 5	Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation	5

Text Books

1	H.A. Taha, Operations Research, An Introduction, PHI, 2008
2	H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3	J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi, 2008
4	Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5	Pannerselvam, Operations Research: Prentice Hall of India 2010
6	Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Useful Links

1.	nptel.iitk.ac.in/
2.	www.myeducationkey.com/
3.	www.wikipedia.Newton.com/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√	√	√	√			√	√	√	√	√
CO 2	√	√	√	√	√	√		√	√	√	√		√	√	
CO 3	√	√	√			√	√	√	√			√	√		√
CO 4	√	√	√	√	√	√	√	√	√	√	√		√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand				
Apply				
Analyze				
Evaluate				
Create				
TOTAL				

Government College of Engineering, Karad

F. Y. M. Tech. Civil -Structural Engineering

OE1158 Open Elective : Composite Materials

Teaching Scheme			Audit course	
Lectures	03Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			TOTAL	100

Course Outcomes (CO)

Student will be able to understand

1.	Property of various composite materials
2.	Manufacturing process of metal and polymer matrix composites
3.	Laminate strength and its failure criteria

Course Contents		Hours
Unit 1	Introduction: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.	5
Unit 2	REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.	5
Unit 3	Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.	5
Unit 4	Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepress – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications	5
Unit 5	Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure.	5
Unit 6	Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.	5

Text Books

1.	Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany. 2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.
2.	Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany. 2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.
3.	Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany. 2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

Reference Books

1.	Hand Book of Composite Materials-ed-Lubin. 2. Composite Materials – K.K.Chawla. 3. Composite Materials Science and Applications – Deborah D.L. Chung. 4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi
2.	Hand Book of Composite Materials-ed-Lubin. 2. Composite Materials – K.K.Chawla. 3. Composite Materials Science and Applications – Deborah D.L. Chung. 4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi
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CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	√
CO 2	√	√	√	√	√		√	√		√	√		√		√
CO 3	√	√	√	√	√	√	√	√		√	√		√	√	
CO 4	√	√	√	√	√	√	√	√	√	√	√		√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand				
Apply				
Analyze				
Evaluate				
Create				
TOTAL				

Government College of Engineering, Karad				
F. Y. M. Tech. Civil -Structural Engineering				
SE1119:AUDIT 1Technical Paper Writing				
Audit Course				
Practical	2hrs/week			
Credit	-			

Course Outcomes (CO)

Students will be able to:

1.	Understand that how to improve your writing skills and level of readability
2.	Learn about what to write in each section
3.	Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Course Contents		Hours
Unit I	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	**4**
Unit II	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts.	4
Unit III	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
Unit IV	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.	4
Unit V	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	4
Unit VI	Useful phrases, how to ensure paper is as good as it could possibly be the first- time submissions	4

Text Books and Reference Books

1.	Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2.	Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3.	Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4.	Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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CO 1	√	√	√	√	√		√	√	√	√	√			√	√
CO 2	√	√	√	√	√		√		√	√	√	√	√	√	
CO 3	√	√	√	√	√	√	√	√			√	√	√		√
CO 4	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyse	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad				
F. Y. M. Tech. Civil -Structural Engineering				
SE1129 AUDIT 1 : DISASTER MANAGEMENT				
Teaching Scheme			**Audit course**	
Lectures	02Hrs/week			
Tutorials	-			
Total Credits	-			

Course Outcomes (CO)

Student will be able to understand

1.	Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
2.	Students should able to apply the concept of non-linear programming
3.	Students should able to carry out sensitivity analysis
4	Student should able to model the real world problem and simulate it

	Course Contents	**Hours**
Unit 1	**Introduction** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	**4**
Unit 2	**Repercussions Of Disasters And Hazards**: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	4
Unit 3	**Disaster Prone Areas In India** Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	4
Unit 4	**Disaster Preparedness And Management** Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	4
Unit 5	**Risk Assessment** Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.	4
Unit 6	**Disaster Mitigation** Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	4

Text Books				
1	R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.			
2	Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.			
3	Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.			

Useful Links				
1.	nptel.iitk.ac.in/			
2.	www.myeducationkey.com/			
3.	www.wikipedia.Newton.com/			

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√	√	√	√	√	√	√		√	√	
CO 2	√	√	√	√	√		√		√	√		√	√		√
CO 3	√	√	√	√	√	√	√	√	√		√	√	√		√
CO 4	√	√	√	√	√		√	√	√	√	√		√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand				
Apply				
Analyze				
Evaluate				
Create				

Government College of Engineering, Karad			
F. Y. M. Tech. Civil -Structural Engineering			
SE1139:AUDIT 1 Sanskrit for Technical Knowledge			
Audit Course			
Practical	2hrs/week		
Credit	-		

Course Outcomes (CO)

Students will be able to:

1.	Understanding basic Sanskrit language
2.	Ancient Sanskrit literature about science & technology can be understood
3.	Being a logical language will help to develop logic in students

Course Contents		Hours
Unit I	· Alphabets in Sanskrit, · Past/Present/Future Tense, · Simple Sentences	8
Unit II	· Order · Introduction of roots · Technical information about Sanskrit Literature	8
Unit III	Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	8

Text Books and Reference Books

1.	Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2.	"Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3.	"India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Useful Links

1.	www.wikipedia.com/

Mapping of COs and POs

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CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	
CO 2	√	√	√	√	√		√	√	√	√	√			√	√
CO 3	√	√	√	√	√	√	√	√			√		√	√	√
CO 4	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyse	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

<table>
<tr><td colspan="5" align="center">Government College of Engineering, Karad</td></tr>
<tr><td colspan="5" align="center">F. Y. M. Tech. Civil -Structural Engineering</td></tr>
<tr><td colspan="5" align="center">SE1149 AUDIT 1: VALUE EDUCATION</td></tr>
</table>

Teaching Scheme			Audit course	
Lectures	02Hrs/week			
Tutorials	-			
Total Credits	-			

Course Outcomes (CO)

Student will be able to understand

1.	1.Understand value of education and self- development
2.	2. Imbibe good values in students
3.	3. Let the should know about the importance of character

	Course Contents	Hours
Unit 1	- Values and self-development –Social values and individual attitudes. - Work ethics, Indian vision of humanism. - Moral and non- moral valuation. Standards and principles. - Value judgements	**4**
Unit 2	- Importance of cultivation of values. - Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. - Honesty, Humanity. Power of faith, National Unity. - Patriotism. Love for nature ,Discipline	4
Unit 3	- Personality and Behaviour Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. - Punctuality, Love and Kindness. - Avoid fault Thinking. - Free from anger, Dignity of labour. - Universal brotherhood and religious tolerance. - True friendship. - Happiness Vs suffering, love for truth. - Aware of self-destructive habits. - Association and Cooperation. - Doing best for saving nature	4
Unit 4	- Character and Competence –Holy books vs Blind faith. - Self-management and Good health. - Science of reincarnation. - Equality, Nonviolence, Humility, Role of Women. - All religions and same message. - Mind your Mind, Self-control. - Honesty, Studying effectively	4

Text Books

1	Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

Useful Links

1.	www.wikipedia.Newton.com/

Mapping of COs and POs

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CO 2	√	√	√	√	√	√		√	√	√			√	√	
CO 3	√	√	√	√	√	√	√	√		√	√	√	√	√	
CO 4	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand				
Apply				
Analyze				
Evaluate				
Create				

overnment College of Engineering, Karad					
F. Y. M. Tech. Civil -Structural Engineering					
SE 1106 :Structural Design Lab I					
Teaching Scheme				**Examination Scheme**	
Practical	2 Hrs/week			CA	25
Total Credits	01			ESE	25
				Total	50

Course Objectives (CO)

1.	Post Graduate should understand the behavior of structure under dynamic loading
2.	Post Graduate should model the structure mathematically, or with use of software analyze and design.
3.	Post Graduate should learn and apply principles of design & investigate the performance of structural elements.
4.	Post Graduate should evaluate the different testing methods and equipment.

Course Contents	**Hours**
Static and Dynamic analysis and design of Multistory Building structures using software (ETABS / STAADPRO)	24
Programming for analysis & Design of Structures.	
Experiments on vibration of multi storey frame models for Natural frequency and modes.	

List of Submissions

1	Total number of Experiments- Minimum 4 /course as given by course teacher depending on course content.
2	Minimum two projects analyzed by software

Mapping of COs and POs

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CO 2	√	√	√	√	√	√	√	√		√			√		√
CO 3	√	√	√	√	√	√		√		√	√		√	√	√
CO 4	√	√	√	√	√	√	√	√	√	√		√	√	√	√

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyse	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad			
F. Y. M. Tech. Civil -Structural Engineering			
Semester II			
SE1201: Theory of Plates and Shells			

Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1.	Post Graduate should understand analysis of 2D flat and curved surfaces.
2.	Post Graduate should know numerical method for the analysis of 2d problems
3.	Post Graduate should understand the behavior of thick plates
4.	Post Graduate should understand the geometry and strength of shell structures.

Course Contents		**Hours**
Unit 1	Introduction to Plate Theory: Thin and Thick Plates, small and large deflection theory of thin plates- assumptions, moment-curvature relations, stress resultants, Governing Differential Equation for bending of plates, various boundary conditions.	**(05)**
Unit 2	Rectangular plates -Navier's solution : Simply supported rectangular plates subjected to uniformly distributed and varying loads on entire area, parabolic loads, sinusoidal loads, partly loaded plates, concentrated loads and couples, distributed couples, symmetric & anti- symmetric loading. Rectangular plates -Levy's solution: Plates subject to uniformly distributed and varying loads and sinusoidal parabolic loads between simply supported edges. Conditions for other two edges simply supported, fixed, free, elastically restrained.	**(05)**
Unit 3	Energy methods: Use of potential energy principle, solution of rectangular plates with various boundary conditions and loadings. Buckling of rectangular plates, circular plates.	**(05)**
Unit 4	Circular Plates: Bending of circular plates with clamped & simply supported edges, Plate with a central hole, uniformly distributed and varying loads, conical loads, distributed couples, ring loads, semicircular plates, axisymmetric loaded plates.	**(05)**
Unit 5	Introduction to shells: Classification of shells on geometry, thin shell theory, equation of 05 shell surfaces, stress resultants, stress displacement relations, compatibility and equilibrium equations. Membrane analysis : a. Equation of equilibrium for synclastic shells, solution for shells subject to self-weight, live load. b. Equation of equilibrium in rectangular coordinate system. Hyper shells, use of Puncher's function, simple problems on hyperbolic paraboloids. Elliptic paraboloidal shells, conoids. c. Cylindrical shells: Equations of equilibrium, open shells with parabolic, circular, elliptical directrix, simple problems. d. Shells with closed directrix-circular, elliptical-simple problems. Problems on pipes carrying fluid/liquid under pressure, just filled & partly filled	**(05)**
Unit 6	Bending theory of cylindrical shells: Symmetrically loaded circular cylindrical shell. Derivation of Governing Differential Equation, resembling that for beam on elastic foundation, beam theory. Finsterwalder's theory: Derivation of governing differential equation of 8th order. D.K.J. theory, Donnell's equation. Characteristic equation. Schorer's theory: Derivation of differential equation.	**(05)**

Text Books and reference books

1.	Theory of plates & shells by Timoshenko & W.Kreiger, S W Tata Mc. Graw. Hill, Pub. Co. Ltd., Delhi, 1985, 2nd Edition.
2.	Design of R. C. shell roofs by G.S. Ramaswamy, CBS Publisher and Distributors, 1s t Edition 2003, Delhi.
3.	Analysis of thin concrete shells by K.Chandrashekhara, Tata Mc.Graw Hill Pub. Co. Ltd, Delhi.
4.	Analysis of thin concrete shells by K.Chandrashekhara, Tata Mc.Graw Hill Pub. Co. Ltd, Delhi.

Useful links

1	**nptel**.iitk.ac.in/
2	www.myeducationkey.com/
3	www.wikipedia.Newton.com/

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CO 2	√	√	√	√	√	√	√	√	√		√		√	√	
CO 3	√	√	√		√	√	√		√	√	√	√	√	√	√
CO 4	√	√	√	√	√	√	√	√	√	√	√		√		√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad

F. Y. M. Tech. Civil -Structural Engineering

SE 1202: Advanced Design of Steel Structures

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1.	Post Graduate will understand natural force systems.
2.	Post Graduate will develop skill of modeling and resolution of force system using mechanics.
3.	Post Graduate will be able to solve industrial problems related to steel structures.
4.	Post Graduate will perform applications in composite construction.

	Course Contents	Hours
Unit 1	Design of Trussed girder bridges and bearings. Deck type and through type bridges, bracing systems, end bearings, mechanical and elastomeric bearings.	(05)
Unit 2	Multi-storey steel buildings, load transfer mechanism, lateral load resisting systems, Design of moment resistant frames, concentrically braced frames, interacting moment resisting frames with shear walls for seismic/ wind effects structural systems, framed tube structures, braced tube structures, tube in tube structures	(05)
Unit 3	Cold-formed light gauge steel sections, special design considerations for compression elements, design of compression elements, stiffened compression elements, multi stiffened elements, design of light gauge beams, behavior under repetitive loads and temperature effects.	(05)
Unit 4	Buckling of beam-column, buckling of sway and non-sway frame, various end conditions, elastically restrained conditions, stiffness and continuous factor, stability function.	(05)
Unit 5	Plastic analysis and design of portal frames, collapse mechanisms, analysis and design of gables, multistory-multiday frames, rectangular and tapered haunch knee, check for stability of frames, plastic moment distribution method, minimum weight design, variable repetitive loads, Introduction to limit states in steel design.	(05)
Unit 6	Concrete-Steel composite sections, elastic behavior of composite beams, shear connectors, behavior at ultimate load, design of composite beams, design of encased steel columns.	(05)

Text Books

1.	Design of steel structures-Vol. II by Ramchandran, standard book house Delhi
2.	Design of steel structures-A.S. Arya. J.L. Ajamani, Nemchand and brothers.
3.	Structural analysis and design of tall buildings by B.S. Taranath. McGraw-Hill.
4.	Steel skeletal Vol. II Plastic behavior and design by J.F.Bekar, M.R. Horne, J. Heyman. ELBS.
5.	Plastic methods of structural analysis by Neal B.G.Chapter and Hall.
6.	Teaching Resource for Structural Steel Design-Vol. III by IIT Madras, Anna University Chennai, SERC, Madras and Institute for Steel Development and Growth (INSDAG), Kolkata.

Useful Links

1.	nptel.iitk.ac.in/
2.	www.myeducationkey.com/
3.	www.bis.org.in

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CO 2	√	√	√	√	√	√		√	√		√	√	√	√	
CO 3	√	√	√	√	√	√	√	√	√	√			√		√
CO 4	√	√	√	√				√			√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad				
F. Y. M. Tech. Civil -Structural Engineering				
SE1213 :ELECIVE III: Earthquake Engineering				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1.	Post Graduate should understand the behavior of structure under dynamic loading
2.	Post Graduate should model the structure mathematically
3.	Post Graduate should understand the physics of the problem
4.	Post Graduate should understand the design of earthquake resistant structures

	Course Contents	**Hours**
Unit 1	Earthquake seismology – Causes of earthquake, Plate tectonics, Earthquake fault sources, Seismic waves, Elastic rebound theory, Quantification of earthquake, Intensity and magnitudes, Earthquake source models.	5
Unit 2	Earthquake ground motion – Seismograph, Characteristics of ground motion, Effect of local site conditions on ground motions, Design earthquake, Design spectra, Development of site specification and code-based design.	5
Unit 3	Ground response analysis – One-dimensional ground response analysis: Linear approaches, Equivalent linear approximation of non-linear approaches, Computer code "SHAKE".	5
Unit 4	Liquefaction and lateral spreading - Liquefaction related phenomena, Liquefaction susceptibility: Historical, Geological, Compositional and State criteria. Evaluation of liquefaction by cyclic stress and cyclic strain approaches, Lateral deformation and spreading, Criteria for mapping liquefaction hazard zones.	5
Unit 5	Seismic design of foundations, Seismic slope stability analysis: Internal stability and weakening instability and Seismic design of retaining walls.	5
Unit 6	Detailing of RCC and Masonry buildings, Provisions of IS- 13920, IS – 4326.	5

Tutorials

	A set of Tutorial per unit is to be submitted.		

Text Books

1.	Dynamics of Structures - R.W. Clough and J. Penziene, McGraw-Hill Pub
2.	Structural Dynamics - Roy Craig, John-Wiley & Sons.
3.	Dynamics of Structures- Theory & Application to Earthquake Engineering – A.K.Chopra. Prentice-H; Pub..
4.	Structural Dynamics - Madhujit Mukhopadhyay , Ane's Student Edition, Ane Books India

Reference Books

1.	Steven Kramer, "Geotechnical Earthquake Engineering", Pearson,2008.
2.	Secoe Pinto, P., Seismic behavior of ground and Geotechnical structure, A. A.
3.	Naeim, F., The Seismic Design Handbook, Kluwer Academic Publication, 2ndEdition, 2001.
4.	Ferrito, J.M, Seismic design criteria for soil liquefaction, Tech. Report of Naval Facilities service center, Port Hueneme, 1997.
5.	

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CO 3	√	√	√	√	√	√	√			√	√	√	√		
CO 4	√	√	√	√	√	√	√	√	√	√	√		√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

<table>
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<tr><td colspan="6" align="center">**F. Y. M. Tech. Civil -Structural Engineering**</td></tr>
<tr><td colspan="6" align="center">**SE1223 :ELECIVE III: Advanced Design of foundations**</td></tr>
</table>

Teaching Scheme			**Examination Scheme**		
Lectures	03 Hrs/week		CT – 1	15	
Tutorials	-		CT – 2	15	
Total Credits	03		TA	10	
			ESE	60	
			Duration of ESE	03 Hrs	

Course Outcomes (CO)

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

1.	Decide the suitability of soil strata for different projects.
2.	Design shallow foundations deciding the bearing capacityof soil.
3.	Analyze and design the pile foundation.
4.	Understand analysis methods for well foundation.

Course Contents		**Hours**
Unit 1	Planning of Soil Explorationfor Different Projects, Methods of Subsurface Exploration, Methods of Borings along with Various Penetration Tests.	**5**
Unit 2	Shallow Foundations, Requirements for Satisfactory Performance of Foundations, Methods of Estimating Bearing Capacity, Settlements of Footings and Rafts, Proportioning of Foundations using Field Test Data, Pressure - Settlement Characteristics from Constitutive Laws.	5
Unit 3	Pile Foundations, Methods of Estimating Load Transfer of Piles, Settlements of Pile Foundations, Pile Group Capacity and Settlement, Laterally Loaded Piles, Pile Load Tests, Analytical Estimation of Load- Settlement Behaviorof Piles, Proportioning of Pile Foundations, Lateral and Uplift Capacity of Piles.	5
Unit 4	Well Foundation, IS and IRC Code Provisions, Elastic Theory and Ultimate Resistance Methods.	5
Unit 5	Tunnels and Arching in Soils, Pressure Computations around Tunnels. Open Cuts, Sheeting and Bracing Systems in Shallow and Deep Open Cuts in Different Soil Types.	5
Unit 6	Coffer Dams, Various Types, Analysis and Design, Foundations under uplifting loads, Soil-structure interaction	5

Tutorials			
	A set of Tutorial per unit is to be submitted.		

Reference Books			
1.	Design of foundation system, N.P. Kurian, Narosa Publishing House		
2.	Foundation Analysis and Design, J. E. Bowles, Tata McGraw Hill New York		
3.	Analysis and Design of Substructures, Sawmi Saran, Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.		

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CO 3	√	√	√	√	√	√	√	√		√	√		√		
CO 4	√	√	√	√	√	√	√	√		√	√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad		
F. Y. M. Tech. Civil -Structural Engineering		
SE1233 :ELECIVE III: Soil Structure Interaction		

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

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

1.	Understand soil structure interaction concept and complexities involved.
2.	Evaluate soil structure interaction for different types of structure under various conditions of loading and subsoil characteristics.
3.	Prepare comprehensive design oriented computer programs for interaction problems based on theory of sub grade reaction such as beams, footings, rafts etc.
4.	Analyze different types of frame structure founded on stratified natural deposits with linear and non-linear stress-strain characteristics.

Course Contents		Hours
Unit 1	Critical Study of Conventional Methods of Foundation Design, Nature and Complexities of Soil Structure Interaction.	5
Unit 2	Application of Advanced Techniques of Analysis such as FEM and Finite Difference Method.	5
Unit 3	Relaxation and Interaction for the Evaluation of Soil Structure Interaction for Different Types of Structure under various Conditions of Loading and Subsoil Characteristics.	5
Unit 4	Preparation of Comprehensive Design Oriented Computer Programs for Specific Problems, Interaction Problems based on Theory of Sub Grade Reaction Such as Beams, Footings, Rafts Etc.	5
Unit 5	Analysis of Different Types of Frame Structures Founded on Stratified Natural Deposits with Linear and Non-Linear Stress-Strain Characteristics.	5
Unit 6	Determination of Pile Capacities and Negative Skin Friction, Action ofGroup of PilesConsidering Stress-Strain Characteristics of Real Soils, Anchor Piles and Determination of Pullout Resistance.	5

Tutorials

	A set of Tutorial per unit is to be submitted.		

Text Books

1.	Analysis & Design of substructures, Swami Saran, Oxford & IBH Publishing Co. Pvt. Ltd.
2.	Design of Foundation System- Principles & Practices, Kurian N. P., Narosa Publishing

Reference Books

1.	Analytical and Computer Methods in Foundation, Bowels J.E.,McGraw Hill Book Co., New York, 1974.
2.	Numerical Methods in Geotechnical Engineering, Desai C.S. and Christian J.T., McGraw Hill Book Co., New York.
3.	Soil Structure Interaction - The real behaviour of structures, Institution of Structural Engineers.
4.	Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg. Vol-17, Elsevier Scientific Publishing Company.
5.	Elastic Analysis of Soil-Foundation Interaction, Selvadurai A.P.S., Elsevier Scientific Publishing Company.

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PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	√
CO 2	√	√	√	√	√		√	√	√	√	√		√	√	√
CO 3	√	√	√	√	√	√	√	√		√	√		√		
CO 4	√	√	√	√	√	√	√	√		√	√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad				
F. Y. M. Tech. Civil -Structural Engineering				
SE 1214: Elective IV- Design of R.C Bridges				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1.	Post Graduate will understand different types of loads related to construction of roads and bridges.
2.	Post Graduate will be able to develop skill of modeling and resolution of force system using mechanics.
3.	Post Graduate will apply structural mechanics for analysis of bridges.
4.	Post Graduate will acquire knowledge of behavior of bridges subjected to different types of situations.

Course Contents		**Hours**
Unit 1	General Basic bridge forms –beam, arch, suspension, various types of bridges, selection of type of Bridge and economic span length, super structure -philosophy, geometric alignment, drainage, road curb, wall foundation, pile foundation, open well foundation.	**(06)**
Unit 2	Design loads for bridges –dead load, vertical live load, IRC loading, wind load, longitudinal forces, centrifugal forces, buoyancy, water current forces, thermal forces, deformation and horizontal forces.	**(05)**
Unit 3	Design of R. C. deck slab, beam and slab, T beam, Pigeaud's theory, Courbon's theory, balanced cantilever bridge, box culvert.	**(06)**
Unit 4	Construction techniques -construction of sub structure footing, piles, cassions, construction of reinforced earth retaining wall and reinforced earth abutments, super structure erection method bridge deck construction, by cantilever method, Inspection maintenance and repair of bridges.	**(04)**
Unit 5	Design of sub structure abutments, Piers, approach slab.	**(04)**
Unit 6	Bearing and expansion joints forces on bearings Types of bearings, design of unreinforced elastomeric bearings, expansion joints.	**(05)**

Tutorials

	A set of Tutorial per unit is to be submitted.

Text Books

1.	Concrete Bridge Practice by Dr. V.K. Raina Tata McGraw Hill Pub. Co.
2.	Reinforced Concrete Structures Vol II by Dr. B. C. Punmia, Ashok Kumar Jain, Anil Kumar Jain – Laxmi Publications, 1992, 7th Edition.
3.	Essential of bridge Eng. By D Johnson Victor, Oxford & IBH Publishing Co. Pvt. Ltd.
4.	Concrete bridge design R. E. Rowe, John Willey & sons, 1963, 1st Edition.
5.	Design of bridge structure by Jagadesh T. R. Jayram M A Prentice Hall of India Pvt. Ltd.
6.	Advanced Reinforced Concrete Design, by N KrishnaRaju, CBS Publication & distributors, 2000, 1st Edition.

Useful Links

1.	nptel.iitk.ac.in/
2.	www.myeducationkey.com/
3.	www.wikipedia.Newton.com/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
CO 2	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
CO 3	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
CO 4	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad				
F. Y. M. Tech. Civil -Structural Engineering				
SE1224: Elective-IV Repairs and Rehabilitation of Structures				
Teaching Scheme			**Examination Scheme**	
Lectures	03Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA/CA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1	Post Graduate should understand causes of deterioration.
2.	Post Graduate should understand Facets of Maintenance, importance of Maintenance, Various aspects of Inspection
3.	Post Graduate should understand causes of distress in concrete /steel structures
4.	Post Graduate should learn Damage assessment and evaluation models.
5.	Post Graduate should learn methods of repair and rehabilitation and should perform Seismic Retrofitting of reinforced concrete buildings.

Course Contents			Hours
Unit 1	**Introduction** to deterioration of structures with aging; Need for rehabilitation. Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.		6
Unit 2	**Distress in concrete /steel structures** Types of damages; Sources or causes for damages; effects of damages; Case studies, Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete – Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion – Effects of cover thickness.		6
Unit 3	**Damage assessment and evaluation models** Damage testing methods; Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.		6
Unit 4	**Rehabilitation methods** Grouting; Detailing; Imbalance of structural stability; Polymer concrete, Sulphur infiltrated concrete, Fiber reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes. Case studies		6
Unit 5	**Methods of Repair** Shortcreting; Grouting; Epoxy-cement mortar injection; Crack ceiling Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – DEMOLITION TECHNIQUES – Engineered demolition methods –Case studies.		6
Unit 6	**Seismic Retrofitting of reinforced concrete buildings** Introduction; Considerations in retrofitting of structures; Source of weakness in RC frame building – Structural damage due to discontinuous load path; Structural damage due to lack of deformation; Quality of workmanship and materials; Classification of retrofitting techniques; Retrofitting strategies for RC buildings – Structural level (global) retrofit methods; Member level (local) retrofit methods; Comparative analysis of methods of retrofitting		6

Text Books and Reference Books			
1.	Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.		
2.	Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987		
3.	DovKominetzky.M.S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001		
4.	Ravishankar.K, Krishnamoorthy.T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.		
5.	Diagnosis and treatment of structures in distress by R.N.Raikar, Published by R&D Centre of Structural		

	Designers & Consultants Pvt. Ltd., Mumbai, 1994			
6.	Earthquake resistant design of structures by Pankaj Agarwal and Manish Shrikhande, Prentice-Hall of India, 2006.			
7.	Handbook on Repair and Rehabilitation of RCC buildings, Published by CPWD, Delhi, 2002.			
Useful Links				
1.	nptel.iitk.ac.in/			
2.	www.myeducationkey.com/			
3.	www.wikipedia.Newton.com/			

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11
CO 1	√	√	√	√	√	√	√	√	√	√	√
CO 2	√	√	√	√	√	√	√	√	√	√	√
CO 3	√	√	√	√	√	√	√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad

F. Y. M. Tech. Civil -Structural Engineering

SE 1234:Elective II- Structural Health Monitoring

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Contents		Hours
Unit 1	Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance	5
Unit 2	Structural Health Monitoring: Concepts Various Measures, Structural Safety in Alteration.	5
Unit 3	Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.	5
Unit 4	Static Field Testing: Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.	5
Unit 5	Dynamic Field Testing: Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring	5
Unit 6	Introduction to Repairs and Rehabilitations of Structures: Case Studies (Site Visits), piezo– electric material and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.	5
Text Books and Reference Books		
1.	Structural Health Monitoring, Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006.	
2.	Health Monitoring of Structural Materials and Components_Methods with Applications, Douglas E Adams, John Wiley and Sons, 2007.	
3.	Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan,Taylor and Francis Group, London, UK, 2006.	

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3.	www.wikipedia.Newton.com/	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	
CO 2	√	√	√	√	√		√				√		√	√	√
CO 3	√	√	√	√		√	√	√	√	√	√		√		√
CO 4	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad			
F. Y. M. Tech. Civil -Structural Engineering			
SE1215: Elective V- Finite Element Method			

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1.	Students should learn the fundamentals of the finite element method for the analysis of engineering problems arising in solids and structures
2.	Students should learn how to judge the quality of the numerical solution and improve accuracy in an efficient manner by optimal selection of solution variables.
3.	To enable the students to formulate the design problems into FEA
4.	Use commercially available, state-of-the-art finite element analysis software to analyze complex structural systems, including interfacing with CAD models and solving nonlinear structural analyses.

Course Contents		Hours
Unit 1	Introduction to Finite Element Method: Principle of minimum potential energy. Variational principle, Galerkin approach, RayleighRitz method, finite element procedure.	**(05)**
Unit 2	1D problems: Discretization, nodes, element incidence, displacement model, shape function, selection of order of polynomials, application to bars with constant and variable cross sections subjected to axial forces. 2D problems: Development of element stiffness matrix and nodal load vector for truss, beam and plane frame elements. Transformation of matrices, relevant structural engineering applications. 2D elements of triangular and quadrilateral shapes 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.	**(05)**
Unit 3	3D problems: Development of element stiffness matrix and nodal load vector for Tetrahedron, Hexahedral elements.	**(05)**
Unit 4	Isoparametric Elements: Shape function. Natural coordinate systems, classification-isoparametric, subparamelric, superparametric elements, 1D & 2D isoparametric elements, Gauss quadrature integration.	**(05)**
Unit 5	Axisymmetric Elements : Development of element stiffness matrix and nodal load vector	**(05)**
Unit 6	Plate and Shell Elements : Formation of stiffness matrix for plate bending elements of triangular and quadrilateral shapes, cylindrical thin shell elements.	**(05)**

Text Books and reference books

1.	The Finite Element Method (fourth edition) vol I & II by O.C. Zienkiewicz & R. L Taylor, Tata McGraw Hill Publication Co. Ltd.
2.	An introduction to the finite element method by J. N. Reddy, Tata McGraw Hill Publication Co. Ltd.
3.	Concepts & applications of finite element analysis by R. D. Cook, John Wiley & Sons ltd.
4.	Introduction to finite element method by C.S. Desai, CBS Publication on & Distributors
5.	Programming in finite element method by C.S.Krishnamoorthy, Tata McGraw Hill Publication Co. Ltd.
6.	Introduction to finite element in engineering by T.R.Chandrupatla and Belegundu, Prentice Hall of India.

Useful links

1	**nptel**.iitk.ac.in/
2	www.myeducationkey.com/
3	www.wikipedia.Newton.com/

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CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	
CO 2	√	√	√	√	√		√			√		√	√		√
CO 3	√	√	√	√		√	√	√	√	√	√	√	√	√	√
CO 4	√	√	√	√		√	√	√	√	√	√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand				
Apply				
Analyze				
Evaluate				
Create				
TOTAL				

Government College of Engineering, Karad			
F. Y. M. Tech. Civil -Structural Engineering			
SE1225: Elective V- Fracture Mechanics			
Teaching Scheme			**Examination Scheme**
Lectures	03 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA/CA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

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

1.	Identify and classify cracking of concrete structures based on fracture mechanics
2.	Implement stress intensity factor for notched members
3.	apply fracture mechanics models to high strength concrete and FRC structures.
4.	Compute J-integral for various sections understanding the concepts of LEFM.

Course Contents	Hours
Unit I Introduction: Basic Fracture Mechanics, Crack in a Structure, Mechanisms of Fracture and Crack Growth, Cleavage Fracture, Ductile Fracture, Fatigue Cracking,	**5**
Unit II Environment assisted Cracking, Service Failure Analysis.	5
Unit III Stress at Crack Tip: Stress at Crack Tip, Linear Elastic Fracture Mechanics, Griffith's Criteria,	5
Unit IV Stress Intensity Factors, Crack Tip Plastic Zone, Erwin's Plastic Zone Correction, R curves, Compliance, J Integral, Concept of CTOD and CMD.	5
Unit V Material Models: General Concepts, Crack Models, Band Models, Models based on Continuum Damage Mechanics, Applications to High Strength Concrete,	5
Unit VI Fiber Reinforced Concrete, Crack Concepts and Numerical Modeling	5

Text Books and References

1.	Elementary engineering fracture mechanics , David Broek – Sijthoff & Noordhoff , Alphen anadem Rijn, Netherlands
2.	Fracture mechanics of concrete structures , Theory and applications, Rilem Report, Edited by L. Elfgreen, Chapman and Hall , 1989.
3.	Fracture mechanics, Applications to concrete, Edited by Victor, C. Li, & Z.P. Bazant, ACI SP 118
4.	Valliappan S. "Continuum Mechanics Fundamentals" (1982), Oxford IBH, N D. New Delhi.
5.	Venkataraman and Patel "Structural Mechanics with introduction to Elasticity and Plasticity" – McGraw Hill, 1990.
6.	Shane's "Introduction to Solid Mechanics , II Edition, PH, 1989

Useful Links

1.	nptel.iitk.ac.in/
2.	www.myeducationkey.com/
3.	www.wikipedia.Newton.com/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	
CO 2	√	√	√	√	√		√	√	√	√			√	√	√
CO 3	√	√	√	√	√	√	√	√		√	√	√	√		√
CO 4	√	√	√	√	√	√	√	√		√	√	√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad			
F. Y. M. Tech. Civil -Structural Engineering			
SE 1235: Elective V-Design of High Rise Structures			

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

1.	Analyze, design and detail Transmission/ TV tower, Mast and Trestles with different loading conditions.
2.	Analyze, design and detail the RC and Steel Chimney.
3.	Analyze, design and detail the tall buildings subjected to different loading conditions using relevant codes.

Course Contents		
Unit I	Design of transmission/ TV tower, Mast and trestles: Configuration, bracing system,	**5**
Unit II	Design of transmission/ TV tower : analysis and design for vertical transverse and longitudinal loads.	5
Unit III	Analysis and Design of RC and Steel Chimney, Foundation design for varied soil strata.	5
Unit IV	Tall Buildings: Structural Concept, Configurations, various systems, Wind and Seismic loads, Dynamic approach,	5
Unit V	Tall Buildings : structural design considerations and IS code provisions. Firefighting design provisions.	5
Unit VI	Application of software in analysis and design.	5

Reference Books

1.	Structural Design of Multi-storied Buildings, Varyani U. H., 2nd Ed., South Asian Publishers New Delhi, 2002.
2.	Structural Analysis and Design of Tall Buildings, Taranath B. S., McGraw Hill, 1988.
3.	illustrated Design of Reinforced Concrete Buildings(GF+3storeyed), Shah V. L. & Karve S. R., Structures Publications, Pune, 2013.
4.	Design of Multi Storied Buildings, Vol. 1 & 2, CPWD Publications, 1976.
5.	Tall Building Structures, Smith Byran S. and Coull Alex, Wiley India. 1991.
6.	High Rise Building Structures, Wolfgang Schueller, Wiley., 1971.
7.	Tall Chimneys, Manohar S. N., Tata McGraw Hill Publishing Company, New Delhi

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	√
CO 2	√	√	√	√	√		√	√	√	√			√	√	
CO 3	√	√	√	√	√	√	√		√	√	√	√	√		√
CO 4	√	√	√	√	√	√	√		√	√	√			√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad			
F. Y. M. Tech. Civil -Structural Engineering			
AU1219 :AUDIT 2 CONSTITUTION OF INDIA			
Teaching Scheme		**Audit course**	
Lectures	02Hrs/week		
Tutorials	-		
Total Credits	-		

Course Outcomes (CO)

Student will be able to understand

1.	1.Understand value of education and self- development
2.	2. Imbibe good values in students
3.	3. Let the should know about the importance of character

	Course Contents	Hours
Unit 1	**History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working)	4
Unit 2	**Philosophy of the Indian Constitution:** Preamble Salient Features	4
Unit 3	**Contours of Constitutional Rights & Duties:** • Fundamental Rights • Right to Equality • Right to Freedom • Right against Exploitation • Right to Freedom of Religion • Cultural and Educational Rights • Right to Constitutional Remedies • Directive Principles of State Policy • Fundamental Duties.	4
Unit 4	**. Organs of Governance:** • Parliament • Composition • Qualifications and Disqualifications • Powers and Functions • Executive • President • Governor • Council of Ministers • Judiciary, Appointment and Transfer of Judges, Qualifications • Powers and Functions	4
Unit 5	• **Local Administration:** • District's Administration head: Role and Importance, • Municipalities: Introduction, Mayor and role of Elected Representative, CEO of • Municipal Corporation. • Pachayatiraj: Introduction, PRI: ZilaPachayat. • Elected officials and their roles, CEO ZilaPachayat: Position and role. • Block level: Organizational Hierarchy (Different departments), • Village level: Role of Elected and Appointed officials, • Importance of grass root democracy	4
Unit 6	• **Election Commission:** • Election Commission: Role and Functioning. • Chief Election Commissioner and Election Commissioners. • State Election Commission: Role and Functioning. • Institute and Bodies for the welfare of SC/ST/OBC and women.	4

Text Books					
1	1 Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi				
Useful Links					
1.	nptel.iitk.ac.in/				
2.	www.myeducationkey.com/				
3.	www.wikipedia.Newton.com/				

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	√
CO 2	√	√	√	√	√		√	√	√	√			√	√	
CO 3	√	√	√	√	√	√	√		√	√	√	√	√		√
CO 4	√	√	√	√	√	√	√		√	√	√			√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand				
Apply				
Analyse				
Evaluate				
Create				

Government College of Engineering, Karad			
F. Y. M. Tech. Civil -Structural Engineering			
SE1229: AUDIT 2 PEDAGOGY STUDIES			
Audit Course			
Practical	2hrs/week		
Credit	-		

Course Outcomes (CO)

Students will be able to:

1.	Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2.	Identify critical evidence gaps to guide the development.

Course Contents		**Hours**
Unit 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.	**4**
Unit II	Thematic overview: Pedagogical practices are being used by teachers in formal And informal classrooms in developing countries, Curriculum, Teacher education.	4
Unit III	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.	4
Unit IV	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	4
Unit V	Research gaps and future directionsResearch design, Contexts, Pedagogy, Teacher education, Curriculum and assessment,Dissemination and research impact.	4

Text Books and Reference Books

1	Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2	Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3	Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4	Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basicmaths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5	Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell
6	Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7	www.pratham.org/images/resource%20working%20paper%202.pdf.

Useful Links

1.	nptel.iitk.ac.in/
2.	www.myeducationkey.com/
3.	www.wikipedia.com/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	√
CO 2	√	√	√	√	√		√	√	√	√			√	√	
CO 3	√	√	√	√	√	√	√		√	√	√	√	√		√
CO 4	√	√	√	√	√	√	√		√	√	√			√	√

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad				
F. Y. M. Tech. Civil -Structural Engineering				
SE1239: STRESS MANAGEMENT BY YOGA				
Audit Course				
Practical	2hrs/week			
Credit	-			

Course Outcomes (CO)

Students will be able to:

1	To achieve overall health of body and mind
2	To overcome stress

Course Contents		Hours
Unit I	Definitions of Eight parts of yoga. (Ashtanga)	**8**
Unit II	Yam and Niyam. Do`s and Don'ts in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	8
Unit III	Asan and Pranayam i) Various yoga poses and their benefits for mind & body ii)Regularization of breathing techniques and its effects-Types of pranayam	8

Suggested reading			
1	'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur		
2	. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata		

Useful Links	
1.	nptel.iitk.ac.in/
2.	www.myeducationkey.com/
3.	www.wikipedia.com/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	√
CO 2	√	√	√	√	√		√	√	√	√			√	√	
CO 3	√	√	√	√	√	√	√		√	√	√	√	√		√
CO 4	√	√	√	√	√	√	√		√	√	√			√	√

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad				
F. Y. M. Tech. Civil -Structural Engineering				
SE1249: Personality Development Through Life Enlightenment Skills				
Audit Course				
Practical	2hrs/week			
Credit	-			

Course Outcomes (CO)

Students will be able to:

1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.
2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
3	Study of Neetishatakam will help in developing versatile personality of students.

Course Contents		Hours
Unit I	Neetisatakam-Holistic development of personality · Verses- 19,20,21,22 (wisdom) · Verses- 29,31,32 (pride & heroism) · Verses- 26,28,63,65 (virtue) · Verses- 52,53,59 (dont's) · Verses- 71,73,75,78 (do's)	8
Unit II	· Approach to day to day work and duties. · Shrimad BhagwadGeeta: Chapter 2-Verses 41, 47,48, · Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, · Chapter 18-Verses 45, 46, 48.	8
Unit III	Statements of basic knowledge. · Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 · Chapter 12 -Verses 13, 14, 15, 16,17, 18 · Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, · Chapter 4-Verses 18, 38,39 · Chapter18 – Verses 37,38,63	8

Suggested reading				
1	" Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata			
2	Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.			
Useful Links				
1.	www.wikipedia.com/			

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	√
CO 2	√	√	√	√	√		√	√	√	√			√	√	
CO 3	√	√	√	√	√	√	√		√	√	√	√	√		√
CO 4	√	√	√	√	√	√	√		√	√	√			√	√

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad					
F. Y. M. Tech. Civil -Structural Engineering					
SE 1207 : Mini Project/ Industrial Training/ Seminar					
Teaching Scheme				**Examination Scheme**	
Practical	2 Hrs/week			TA/CA	25
				ESE	25
Total Credits	1			TOTAL	50

Course Outcomes (CO)

At the end of the course, the student will be able to:

1.	Identify structural engineering problems reviewing available literature.
2.	Study different techniques used to analyze complex structural systems.
3.	work on the solutions given and present solution by using his/her technique applying engineering principles.

Course Contents	Hours
Mini Project 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 involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution. Continuous assessment ofMini Project/Industrial training at Mid Sem and End Sem will be monitored by the departmental committee. Seminar should be based on Dissertation work is to be delivered by the student on topic related to structural engineering. The work done is to be evaluated by three members committee headed by HOD wherein guide should be one of the members.	**(24)**

1.	Analysis and design and detailing of a multi-story building using STAAD Pro and ETABS by D. Rajendran.	
2.	Analysis of Structural elements by STAAD Pro for beginners by Raghunandan M. H.	
3.	MATLAB, an introduction with applications by Amos Gilat.	

Useful Links

1.	https://www.csiamerica.com/products/etabs
2.	https://www.bentley.com/en/products/product-line/structural-analysis-software/staadpro
3.	https://in.mathworks.com/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	√
CO 2	√	√	√	√	√		√	√	√	√			√	√	
CO 3	√	√	√	√	√	√	√		√	√	√	√	√		√
CO 4	√	√	√	√	√	√	√		√	√	√			√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad				
F. Y. M. Tech. Civil -Structural Engineering				
SE 1208 : Structural Design Lab II				
Teaching Scheme			**Examination Scheme**	
Practical	4 Hrs/week		TA/CA	25
			ESE	25
Total Credits	2		TOTAL	50

Course Outcomes (CO)

1.	Post Graduate may develop skill of modeling and resolution of force system using software.
2.	Post Graduate will be able to model the structure mathematically
3.	Students will understand advanced applications in structural design

Course Contents		**Hours**
Unit 1	**Reinforced Concrete RC Building Frames:** • Development of structural framing plan from architectural plan. • Modelling of R/C Frames using line elements based on gross, transformed and cracked section properties. • Equivalent 2D idealization of building frames for simplified 2D Analysis. • Simplified 2D analysis under gravity loads as per IS: 456-2000. • Seismic analysis of R C building frame	**(04)**
Unit 2	**3D analysis and design of Building Frames:** • 3D modelling and analysis of RC Framed Building • Structures under design load combinations including earthquake loads using standard commercial software such as STAAD Pro, SAP 2000 etc. • Post-processing of analysis results for design of structural Elements. • Comparison with design output of the software.	**(07)**
Unit 3	**Liquid Retaining Structures:** • Basic design philosophy. • Analysis and design of single cell rectangular water tanks subjected to hydrostatic loading based on plate theory.	**(04)**
Unit 4	**Earth Retaining Structures:** • Basic design philosophy. • Calculation of lateral earth pressure based on • Rankine's theory. • Analysis and design of RC gravity walls, cantilever walls and Counterfort walls. • Introduction to soil-structure interaction.	**(07)**
Unit 5	**Gantry Girders:** • Introduction to function and general arrangement of crane girders. • Calculation of design loading as per IS criteria, simplified modelling and analysis of crane girders under vertical, horizontal and torsional moments, design of built-up gantry girder.	**(04)**
Unit 6	**Steel Railway Truss Bridges:** • Economical span of railway truss bridges. • Economical truss configuration. • General Arrangement and preliminary design. • Preliminary design. • Calculation of dead loads, live loads (Broad Gauge), wind loads, centrifugal loads, racking loads as per Bridge Rules (IRS), analysis and design of truss members.	**(06)**

Reference Books

1.	Analysis and design and detailing of a multi-story building using STAAD Pro and ETABS by D. Rajendran.
2.	Analysis of Structural elements by STAAD Pro for beginners by Raghunandan M. H.
3.	MATLAB, an introduction with applications by Amos Gilat.

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CO 1	√	√	√	√	√		√	√	√	√	√	√	√	√	√
CO 2	√	√	√	√	√		√	√	√	√			√	√	
CO 3	√	√	√	√	√	√	√		√	√	√	√	√		√
CO 4	√	√	√	√	√	√	√		√	√	√			√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	2	2	2	10
Create	2	2	1	10
TOTAL	15	15	10	60

Government College of Engineering, Karad
Second Year (Sem – III) M. Tech. Structural Engineering
SE 1301 : Dissertation Phase I

Teaching Scheme			Examination Scheme	
Practical	14 Hrs/week		CA	100
Total Credits	07		ESE	100
			TOTAL	200

Course Outcomes (CO)

1.	Student will perform extensive literature survey on the research topic of work.
2.	Student will be able to identify the problem statement for the research work.
3.	Student will decide methodology for the research work.
4.	Student will be able to carry out initial mathematical modeling or experimental set up.

	Course Contents	Hour /week
	The dissertation work is to be carried out individually commences in the Semester III and extends through Semester IV. The topic of dissertation work should be related to the areas of Structural Engineering, Earthquake Engineering , Structural Dynamics, Composite Structures, Smart Materials & Structuresetc. Applications of computer as a tool for conceptualization, analysis, optimization, design, simulation of systems, experimental study, etc. are to be encouraged and preferred. The student can work in the Institute or work on field under as per the recommendation by Guide and Head of the Dept., related to Dissertation work. **SYNOPSIS APPROVAL** **The Head of the Department shall appoint a committee comprising of the Guide and two experts to review and approve the synopses.** **Course Contents Hours** It shall include the problem definition, literature survey, approaches for handling the problem, finalizing the methodology for the dissertation work and design calculations / experimental design etc. A report of the work shall be submitted at the end of Semester III after approval by the Guide and endorsement of the Head of Department. It will be assessed for term work, by the evaluation committee (*) appointed by the Head of the Department, for appropriateness, sufficiency of contents and offer suggestions if any. (*) Note: The evaluation committee shall consist of the Guide, one senior expert faculty member and the Head of the Department or his/her representative. The term work under this submitted by the student shall include. 1) Work diary maintained by the student and countersigned by his guide/ industrial guide. 2) The content of work diary shall reflect the efforts taken by candidates for (a) Searching the suitable project work and literature review (b) Visits to different factories or organizations. (i) The brief report of feasibility studies carried to come to final conclusion. (j) Rough / free hand sketches/ drawing. (k) Design calculations carried by the student.	14

	The student has to make a presentation before departmental committee comprising proposed title, literature review, research gap/ objectives, research plan and expected outcome. It is expected to complete minimum 40 % research work. Evaluation of Dissertation- I will be made as per rubrics **List of Submission** Project/Dissertation Report	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11
CO 1	√	√	√	√	√		√	√	√		√
CO 2	√	√	√	√	√	√	√	√	√	√	
CO 3	√	√	√	√	√	√		√	√	√	√
CO 4	√	√	√	√				√		√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	CA/TA	ESE
Remember			18	
Understand			18	
Apply			16	
Analyze			16	
Evaluate			16	
Create			16	
TOTAL			100	

Government College of Engineering, Karad					
Second Year (Sem – IV) M. Tech. Structural Engineering					
SE 1402 : MOOCs / OPEN COURSE					
Teaching Scheme				**Examination Scheme**	
Practical	-			TA/CA	-
Total Credits	3			ESE	-
				TOTAL	-
Course Outcomes (CO)					
Student will be able to :					
1.	Identify self-learning topics.				
2.	Explore the survey literature and contact resource persons for the selected topic of research.				
3.	Develop oral and written communication skills to present and defend their work in front of technically qualified				
	Course Contents				**Hours/week**
	Online courses available on digital platform like MOOCs/ NPTEL/ Coursera etc during the academic semester will be reviewed and listed by departmental faculty board before start of every semester. Suitable course for registered candidate will be recommended by Guide and Programme Head considering skill sets and knowledge required for dissertation work of the individual candidate (from the list). It shall have minimum 8-12 week duration, peer graded assignment and examination to award grade by online course offering agency. The report of course completed with copy of Grade Report shall be submitted to the examination section. In case online course is not available, departmental committee will specially design syllabus for course under self-learning mode and guide will conduct end semester examination to award the grade.				**32**

Government College of Engineering, Karad
Second Year (Sem – IV) M. Tech. Structural Engineering
SE 1401 : Dissertation Phase II

Teaching Scheme				Examination Scheme	
Practical	32Hrs/week			TA/CA	100
Total Credits	16			ESE	200
				TOTAL	300

Course Outcomes (CO)

1.	Student will be able to study technical reports on the research topic of work.
2.	Student will be able to carry out detailed mathematical modelling or experimental validation.
3.	Student will be able to draw inferences from the findings and present conclusion.
4.	Student will be able to learn presentation skills for technical report.

	Course Contents	Hours/week
	Dissertation (Phase-II): The candidate shall submit the detailed report as per the synopsis approved, in the prescribed format after approval by the Guide and endorsement by the Head of the Department. It will be assessed for term work by the evaluation committee appointed by the Head of the Department, for completion of the proposed work. (*) Note: The evaluation committee shall consist of the Guide, one senior expert faculty member and the Head of the Department or his/her representative. The dissertation submitted by the student on topic already approved by institute authorities on basis of initial synopsis submitted by the candidate, shall be according to following guide lines. Format of dissertation report: The dissertation work report shall be typed on A4 size bond paper. The total number of minimum pages shall not be less than 60. Figures, graphs, annexure etc be as per the requirement. The report should be written in the standard format. 1. Title sheet 2. Certificate 3. Acknowledgement 4. List of figures, Photographs/Graphs/Tables 5. Abbreviations. 6. Abstract 7. Contents. 8. Text with usual scheme of chapters. 9. Discussion of the results and conclusions Bibliography (the source of illustrative matter be acknowledged clearly at appropriate place IEEE/ASME/Elsevier Format) Deviation of work from approved synopsis is not permitted. Evaluation of Dissertation- II will be made as per rubrics. Dissertation completion certificate from sponsoring industry is necessary. Acceptance letter/ published one research paper in quality journal/ conference is essential. **List of Submission** Project/Dissertation Report	32

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√		√	√	√		√	√		√	√
CO 2	√	√	√	√	√	√	√	√	√	√		√	√	√	√
CO 3	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
CO 4	√	√	√	√				√		√		√	√	√	√

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	CA/TA	ESE
Remember			18	36
Understand			17	34
Apply			16	32
Analyse			17	34
Evaluate			16	32
Create			16	32
TOTAL			100	200