Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE 2711: (Open Elective- IV) Advanced Computing for Civil Engineering

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	3		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student will be able to

1.	apply logic and algorithm for a program to serve a purpose
2.	code a program
3.	utilize the program to serve a purpose

	Course Contents	Hours
Unit 1	**Computing Fundamentals** Logic, Iterators, Filters, Nesting, Operators, Binning, List and Insertion Sort, Table and Dictionary, Graph and matrix, Backtracking, Tree, BFS and DFS, Tow-Down and Bottom-Up approaches, decision tree, classification	**(07)**
Unit 2	**Programming Fundamentals** Data Structures, Conditionals, Iterations and Ranges, Basic Collectors, File Operations, Module System, Graph Algorithm, Divide and Conquer, Abstract Data Types, Dynamic Flow, Network Flow and LLP Java: Class Hierarchy, Inheritance and Overriding, Polymorphism, Cloning, I/O Serialization and Packages, Concurrent Programming, Exception Handling, Generic and call backs.	**(07)**
Unit 3	**Applied Statistics** Introduction, Frequency Distribution, Measures of Central Tendency and Dispersion, Association with 2 variables, Principle of Counting and Factorial, Permutations and Combinations, Probability (Basic, Conditional), Random Variables (Discrete, Continuous, Poisson and Binomial) (Single and Multiple) and its applications, Mass and Density Functions, Expectation and Variance, Estimation and Inference, Hypothesis Testing	**(12)**
Unit 4	**Database Management** Relational Model, Query (and its optimization) and Database Design, Functional Dependency and Normal Forms, Transaction, Hashing and Indexing, Storage management, Back-up and Recovery, Numpy and Basic Panda processing of data, Sorting and Searching	**(06)**
Unit 5	**Modern Application Development** Multiple Forms, Backend and Frontend Validation, Access Control - User Authentication and Access without login, Complete Flow and Framework, Web Server, Client-Server Communication (HTTP and DNS), Cloud Computing, Single User Processing, Transaction and User Separation,	**(06)**
Unit 6	**Applications** General: Payment Gateway and Accounting, Communication and Collaboration, Database Management, Robust and Lean Systems, Cloud Centralization Civil Engineering Specific: PM, BIM, ERP, etc	**(04)**

Text Books

1.	Computational Thinking - G. Venkatesh and Mahadevan Mukund (2020)
2.	Think Python - Allen B. Downey (O'Reilly, 2015)
3.	Fundamentals of Database Management System - MukeshNegi 2019

Reference Books

1.	Introductory Statistics - Sheldon Ross (3rd Edition - 2010) or newer
2.	Learning React: Modern Patterns for Developing React Apps - Alex Banks, Eve Porcello 2020

Useful Links

1.	IITM Data Science BSc Courses – Computational Thinking, Programming in Python and Programming Concepts using Java (www.onlinedegree.iitm.ac.in)
2.	NPTEL – Modern Application Development by Prof. Gurv Raina and Mr. Tanmay Gopal (https://nptel.ac.in/courses/106/106/106106156/)
3.	Coursera - IBM DevOps and Software Engineering Professional Certificate (https://www.coursera.org/professional-certificates/devops-and-software-engineering)

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
CO 1	2	3	3	2	2	1	-	-	-	-	-	-	2	2
CO 2	2	3	3	2	2	1	-	-	-	-	-	-	2	2
CO 3	2	3	3	2	2	1	-	-	-	-	-	-	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	4	12
Understand	3	3	4	12
Apply	3	3	6	12
Analyse	3	3	-	12
Evaluate	3	3	-	12
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE2721: (Open Elective- IV) Data Science for Civil Engineering

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	3		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to

1.	make use of Database Management Systems (DBMS)
2.	run basic Machine Learning (ML) Models
3.	deploy and Train Artificial Intelligence (AI) Systems

	Course Contents	Hours
Unit 1	**Introduction** Data Science, ML and AI, History and Philosophy, Caution in ML Basics Tools (Scikit Learn Library for ML in Python) and Coding Logic - Iterators, Filters, Operators, Nesting, Binning, List and Sort, Table and Dictionary, Matrix, Backtracking, BFS and DFS	**(04)**
Unit 2	**Applied Mathematics** Calculus, Linear Algebra - Least Square Regression, Eigen Values and Vectors, Symmetric Matrices, Single Value Decomposition, Principal Component Analysis **Applied Statistics** Frequency Distribution, Permutations and Combinations, Probability, Random Variables, (Discrete, Continuous, Poisson and Binomial) (Single and Multiple) and its applications, Expectation and Variance, Hypothesis Testing	**(06)**
Unit 3	**Optimization** Constrained and Unconstrained Optimization, Convex Sets, Functions, Lagrange Multipliers and Logistic Regression, Parameter Estimation, Expectation-Maximization, Polynomial Regression, Optimal Paths, ant colony optimization, Optimal Paths, **Algorithms** State and Solution Space, DF, BF, Heuristic, Stochastic local, Search Systems, Population-based methods, genetic algorithms, emergent system and, Monotone Conditions, Escaping Local Optima, Graph Plan, Algorithm Minimax.	**(06)**
Unit 4	**Machine Learning Models** Probabilistic Models, Models of Regression, Models of Classification (Nearest Neighbours). Support Vector Machines, Decision Tree, Ensemble Methods, Random Forests, Model Selection and Tuning, Hierarchical Clustering, Time Series Modelling and Forecasting, Regression (Path Variables) and Model-Based Diagnostics, Anomaly Detection, Large Scale ML.	**(05)**
Unit 5	**Artificial Intelligence** Regularization of Training data, Neural Networks and Deep Learning, Clustering, Reinforcement Learning and Generative Adversarial Networks, Transfer Learning, Unsupervised Learning Featurisation and Deployment, Dimensionality Reduction, Forward and Backward Chaining, Waltz Algorithm (Constraint Processing) and Arc Consistency, Pattern Directed and Forward Chaining Interference and Rete Algorithm.	**(05)**
Unit 6	**Applications** General: Game Play, Domain Dependent, Goal Stack Planning and Domain Dependent, Deductions as search, Recommender System, Photo OCR, Natural Language Processing, Learning System Design Civil Engineering Specific: Satellite Image Processing, Geo-Informatics, Hydrological Analysis, Design and Modelling, Survey, Infrastructure and Real Estate Market Studies	**(04)**

Text Books

1.	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (AurelienGeron - 2017)
2.	Practical Statistics for Data Scientists - Peter C. Bruce, Andrew Bruce, Peter Gedeck 2017

Reference Books

1.	Artificial Intelligence (3rd edition) - Stuart Rusell
2.	Neural Networks and Deep Learning - Charu C. Agrawal 2018

Useful Links			
1.	IITM Data Science BSc Course – Statistics, Machine Learning Foundation, Database Management System, (www.onlinedegree.iitm.ac.in)		
2.	NPTEL - Data Science for Engineers by Prof. Raghunathan Rengaswamy (https://nptel.ac.in/courses/106/106/106106179/)		
3.	Coursera - Introduction to Data Science Specialization (https://www.coursera.org/specializations/introduction-data-science)		

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
CO 1	2	3	3	2	2	1	-	-	-	-	-	-	2	2
CO 2	2	3	3	2	2	1	-	-	-	-	-	-	2	2
CO 3	2	3	3	2	2	1	-	-	-	-	-	-	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	4	12
Understand	3	3	4	12
Apply	3	3	6	12
Analyse	3	3	-	12
Evaluate	3	3	-	12
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE2712: (Elective III) Remote Sensing and GIS

Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	CT – 1	15
Tutorials	-	CT – 2	15
Total Credits	3	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to

1.	understand and interpret the satellite data
2.	demonstrate GIS Components and techniques.
3.	apply GIS tools over Satellite data to derive various products

	Course Contents	Hours
Unit 1	**Remote Sensing Data and Corrections:** Overview and Introduction, Basics of Remote Sensing, airborne and space born sensors, passive and active remote sensing EMR spectrum, energy sources and radiation principles, energy interactions in the atmosphere, energy interactions with earth surface features, spectral reflectance curves Satellites and orbits, spectral, radiometric, spatial resolutions and temporal resolution of satellites	**(06)**
Unit 2	**Error corrections in satellite image:** Parameters affecting remote sensing, Bidirectional Reflection Distribution Function (BRDF), Concept of DN, DN to Radiance Conversion, Sources of Error and respective corrections: Atmospheric, Geometric, Topography, Radiometric, Source-Sensor Geometry, Material Property and Field of View (FoV)	**(08)**
Unit 3	**Digital Image Processing:** contrast stretching – linear and non-linear stretching filtering techniques, edge enhancement density slicing, thresholding, time composite images, synergetic images. Principal component analysis, Band Arithmetic, Ratio images, Vegetation indices (NDVI), Infrared Index, NDWI, NDSI **Image Classification:** Supervised and Unsupervised Classification: Clustering techniques: K-Mean, ISODATA Clustering, Training Data , Supervised Classifiers, Accuracy Assessment, Confusion Matrix, Kappa Coefficient.	**(08)**
Unit 4	**Geographical Information System**: Components of GIS, types of vector data and concept of topology, Raster data models and comparisons with vector, TIN data model and comparisons with raster, Non-spatial data (attributes) and their types, Raster data compression techniques, Spatial database systems and their types, Pre-processing of spatial datasets, Geo-referencing, Different map projections, Spatial interpolation techniques	**(08)**
Unit 5	**DEM and GIS Analysis:** Digital Elevation Models and different types of resolutions, Quality assessment of freely available DEMS, GIS analysis: Overlaying Operations, Buffer Analysis., Classification Methods, Errors in GIS and Key elements of maps, Limitations of GIS	**(06)**
Unit 6	**Applications of Remote Sensing and GIS**: Applications in Natural Disaster- landslides, flood, drought, volcano. applications in Transportation Engineering, applications in Cryosphere, groundwater studies, applications in Urban planning, applications in Watershed Management, reservoir silting.	**(06)**

Text Books

1.	T.M. Lillesand and R.W. Kiefer, 'Remote Sensing and Image Interpretation', John Wiley & Sons, New York. 6th edition, 2008
2.	Chang K., "Introduction to Geographic Information Systems", McGraw-Hill Education 2006
3.	Burrough P.A. and McDonnell R.A., "Principles of Geographical Information Systems", Oxford University Press, 2006.

Reference Books

1.	Michael Worboys and Matt Duckham, GIS: A Computing Perspective -2nd edition, CRC Press, Boca Raton, 2004
2.	Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

Useful Links

1.	Introduction to Geographic Information Systems by Prof. Arun K. Saraf, IIT Roorkee https://onlinecourses.nptel.ac.in/noc20_ce20/preview

2.	Remote Sensing and GIS by Dr. Rishikesh Bharti, IIT Guwahati https://nptel.ac.in/courses/105/103/105103193/
3.	Basics of Remote sensing, GIS & GNSS technology and their applications by Dr. Poonam S. Tiwari Indian Institute Of Remote Sensing https://onlinecourses.swayam2.ac.in/aic20_ge05/preview

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
CO 1	1	1	2	1	1	-	-	-	-	-	-	1	1	1
CO 2	2	1	2	1	2	-	-	-	-	-	-	1	2	1
CO 3	1	2	3	1	3	1	-	-	-	-	-	1	1	1

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	2	2	10
Understand	5	5	2	15
Apply	5	5	2	15
Analyse	-	3	2	15
Evaluate	-	-	2	5
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE2722: (Elective III) Water Power Engineering

Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	CT – 1	15
Tutorials	-	CT – 2	15
Total Credits	3	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

The students will be able to

1.	prepare load curve and calculate firm power and secondary power from power duration curve.
2.	understand environmental effects of hydropower installation.
3.	determine economical diameter of penstocks, workout thoma coefficient in cavitation of turbine.
4.	utilize the concepts in the course to analyse similar systems, which will acknowledge students to work together in a project related to the course content.

	Course Contents	Hours
Unit 1	**Water Power**: Introduction Sources of Energy, Role of Hydropower in a plant system, Estimation of water power potential.	**(04)**
Unit 2	**Electrical Load on Hydro Turbines** : Load Curve, load Factor, Capacity Factor, utilization factor, Diversity Factor, load Duration Curve, Firm Power, Secondary Power , Prediction of load.	**(05)**
Unit 3	**Types of hydro power plant** : classification of hydel plants, Micro hydel plant, Run of river plants, General Arrangements of Run of River Plants, Valley Dam plants, Diversion Canal Plants, High Head diversion plants, Storage and pondage , Pumped storage power plants, Advantages of Pumped storage power plants, Types of Pumped storage power plants.	**(08)**
Unit 4	**Penstocks**: General classification, design criteria, Economical diameter, Anchor blocks, Conduit valves, Bends and manifolds.	**(05)**
Unit 5	**Turbines:** Introduction, main types of turbines, Reversible type of turbines, Hydraulics of turbines, Velocity Triangles and nomenclature, Basic flow equations, Draft tubes, Cavitation in turbines, Turbine model testing, characteristics of turbines, Thoma's coefficient.	**(07)**
Unit 6	**Water Hammer and Surges:** Introduction, Water Hammer, Transients caused by turbine, Load acceptance and rejection, Resonance in Penstocks, Channel Surges, Surge tanks, types of surge tank, design criteria for surge tank. Intakes: types losses, Air entertainment, Intel aeration, Canals, Forebay, Tunnel.	**(07)**

Text Books

1.	Dandekar and Sharma, "Water Power Engineering" ,Vikas Pub. House Pvt. Ltd.
2.	Bhattacharya P. K., "Water Power Engineering" , Khanna Publications, New Delhi
3.	Deshmukh M. M. "Water Power Engineering" , Dhanapatrai and Sons N. Delhi

Reference Books

1.	Creager and Justin, "Hydro – Electric Hand Book"
2.	Brown G., "Hydro-electric Engineering Practice" , Vol. I to III
3.	Mosonvi, "Water Power Development"
4.	Streeter V. L. & Wylie E. B.; Hydraulic Transient; McGraw Hill Book Company, New York, 1990
5.	ChaudharyHanif; Applied Hydraulic Transients; Van Nostrand Rein Hold Company, New York,1992
6.	Sharma R.K. & Sharma T.K.; A Text book of Water Power Engineering, S. Chand Publication, 2003

Useful Links

1.	http://nptel.ac.in/courses/112/107/112107291 IIT Roorki, Prof. Ravi Kumar
2.	http://nptel.ac.in/courses/105/105/105105110 IIT Kharagpur

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
CO 1	3	2	-	2	2	-	-	-	-	1	1	-	1	2
CO 2	3	2	2	2	2	2	1	1	1	2	1	1	2	1
CO 3	3	2	2	2	3	3	1	1	1	1	1	1	1	2
CO 4	3	3	2	3	2	2	3	2	2	2	2	1	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	2	12
Understand	3	3	2	12
Apply	3	3	2	12
Analyse	3	3	2	12
Evaluate	3	3	2	12
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE2732: (Elective III) Ground Improvement Technique

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	3		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to

1.	understand the concept and importance of the ground improvement technique
2.	identify application areas for different ground improvement techniques
3.	select and analyse site specific method of improvement and its design

	Course Contents	Hours
Unit 1	**Ground Improvement Mechanical Modification** Ground Improvement: Definition, Objectives of soil improvement, Classification of ground improvement techniques, Factors to be considered in the selection of the best soil improvement technique. Mechanical Modification: Type of mechanical modification, Aim of modification, compaction, Principle of modification for various types of soils.	**(05)**
Unit 2	**Compaction and Dewatering Techniques:** Engineering properties of the soft, week and compressible deposits, Natural on land, off-shore and Man-made deposits. Effect of compaction on various soil properties, Drainage techniques - Well points - Vacuum and electro osmotic methods - Seepage analysis for two-dimensional flow-fully and partially penetrating slots in homogenous deposits.	**(08)**
Unit 3	**In-situ treatments methods:** In-situ densification soils, Dynamic compaction and consolidation, Vibro-floation, Sand pile compaction, Preloading with sand drains and fabric drains, Granular columns, Micro piles, Soil nailing, Ground Anchors, components, load transfer mechanism, rock anchors, anchors in granular soil, anchors in cohesive soil, Rock bolt, types, action of rock bolt, Soil nailing, analysis of nailed soil	**(10)**
Unit 4	**Soil Stabilization:** Lime stabilization – suitability, process, special effects, criteria for lime stabilization. Criteria for cement stabilization. Stabilization using Fly ash, Electro osmosis, Soil freezing	**(05)**
Unit 5	**Earth Reinforcement:** Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth-embankments – use of Geotextiles for filtration, drainage and separation in road and other works. Effect of grouting. Chemicals and materials used. Types of grouting, Grouting procedure. Applications of grouting. Shotcrete	**(07)**
Unit 6	**Stability of Slopes and Field Observations:** General characteristics,Types of failures,Causes of failures,Purpose of stability computation, Investigation of failures ,Procedure ,Case studies, Stability of Hill side slopes ,Open cuts ,Engineering problems involving the stability of slopes,Cuts in sand, Homogeneous and soft clay slopes – Sudden spreading of clay slopes, Observation studies during construction ,Post construction, piezometers, Settlement plates, Inclinometer	**(08)**

Text Books

1.	Purushothama Raj. P, Ground Improvement Techniques, Lakshmi Publications, 2nd Edition, 2012.
2.	NiharRanjanPatra, Ground Improvement Techniques, Vikas Publishing House, First Edition, 2012.
3.	G. V. Rao and G. V. S. Rao, Text Book On Engineering with Geotextiles, Tata McGraw Hill, Third Edition 2016

Reference Books

1.	Koerner R.M., "Construction and Geotechnical Methods in Foundation Engineering", McGraw-Hill, 1994.
2.	Purushothama Raj, P. "Ground Improvement Techniques", Tata McGraw-Hill Publishing Company, New Delhi, 1995
3.	Moseley M.P., Ground Improvement Blockie Academic and Professional, Chapman and Hall, Glassgow, 1993.
4.	B. M. Das, Principles of Foundation Engineering, Thomson, Indian Edition
5.	Coduto, D.P., Geotechnical Engineering – Principles and Practices, Prentice Hall of India Pvt.Ltd. New Delhi, 2011.

Useful Links	
1.	Ground Improvement Technique- Prof. G. L. Sivakumar Babu https://nptel.ac.in/courses/105/108/105108075/
2.	Ground Improvement,- Prof. Dilip Kumar Badiya https://nptel.ac.in/courses/105/105/105105210/

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
CO 1	2	-	1	-	-	-	1	-	-	-	-	1	1	2
CO 2	3	3	1	2	-	2	1	1	-	2	-	1	1	2
CO 3	3	3	3	3	2	2	1	1	-	2	-	1	1	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	2	2	-	8
Understand	5	5	3	20
Apply	3	3	2	12
Analyse	3	3	3	12
Evaluate	2	2	2	8
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech Civil Engineering

CE2742 : (Elective III) Industrial Waste Treatment

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Total Credits	03		CT – 2	15
			TA	10
			ESE	60
			Duration of ESE	**02 Hrs 30 Min**

Course Outcomes (CO)

Students will be able to

1.	understand and apply concepts of industrial wastewater treatment.
2.	analyse and evaluate the industrial wastewater and common effluent treatment systems
3.	design the industrial wastewater treatment facilities

	Course Contents	Hours
Unit 1	**Introduction:** Classification of industries, general water requirements in industry, industrial water reuse, cooling tower make up water, water and salt balances in cooling tower, Common water quality problems in cooling water tower systems, estimation of blow down water composition, analysis of scaling potential by Langlier and Ryzner indexes	**(04)**
Unit 2	**Waste minimization techniques:** waste audit, concept of waste minimization, techniques of volume and strength reduction, Equalization: process, flow and quality, location, volume requirement, design considerations, reuse and recycling concepts, process description, objectives, and methods of neutralization and proportioning	**(05)**
Unit 3	**Industrial Wastewater Treatment for Agro based industries:** Manufacturing processes, water usage, sources, quantities, and characteristics of effluents (process stream and combined), pollution effects, waste reduction / reclamation / by-product recovery, utilization, alternative methods of treatment, and disposal for i) Agro-based industries: Sugar, Distillery, Dairy, Pulp and paper mill, Textile	**(10)**
Unit 4	**Industrial Wastewater Treatment for Chemical and Engineering Industries:** Manufacturing processes, water usage, sources, quantities, and characteristics of effluents (process stream and combined), pollution effects, waste reduction / reclamation / by-product recovery, utilization, alternative methods of treatment, and disposal for 1. Chemical industries: Pharmaceutical, Petroleum and refineries, Fertilizer and Tannery 2. Engineering industries: Steel, Electroplating, Foundries, Sponge iron unit, Alumina/aluminum manufacturing unit, Copper smelter 3. Thermal power plants	**(10)**
Unit 5	**Common Effluent Treatment Plant:** concept, objectives, methodology, cost benefit analysis, design, operation and maintenance	**(03)**
Unit 6	**Industrial Project Report:** Project report preparation for waste treatment and disposal system of industries, Pre-feasibility, feasibility and detailed project reports, project financial appraisal.	**(04)**

Text Books

1.	Rao M. N. and Datta, "Waste Water Treatment", Oxford & IBH Publication, 1st Edition, 1992.
2.	Masters, G, M, "Introduction to Environmental Engineering and Science", Pearson Education, 2004.

Reference Books

1.	Nelson Nemerow, "Theories and Practices of Industrial Waste Treatment", Wiley Publication Company, 1st Edition, 1971.
2.	Eckenfelder, W. W., "Industrial Water Pollution Control", McGraw-Hill, 2000.
3.	Nemerow, N. L and Dasgupta, A., "Industrial and Hazardous Waste Treatment", Van Nostrand Reinhold (New York), 1988.
4.	"IS Standards for Treatment and Disposal of Various Industries".

Useful Links

1.	NPTEL Course – Civil Engineering – Wastewater Management – By Prof. M. M. Ghangrekar, IIT Kharagpur – https://nptel.ac.in/courses/105/105/105105048/
2.	NPTEL Course – Civil Engineering – Wastewater Treatment and Recycling – By Prof. Manoj Kumar Tiwari, IIT Kharagpur – https://nptel.ac.in/courses/105/105/105105178/

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
CO 1	3	1	1	1	1	2	3	1	-	2	-	1	3	3
CO 2	1	2	1	1	1	2	3	1	-	2	-	1	3	3
CO 3	1	1	3	2	2	2	3	1	1	-	-	1	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	05	-	02	12
Understand	05	05	02	12
Apply	05	05	02	12
Analyse	-	05	02	12
Evaluate	-	-	02	12
Create	-	-	-	-
TOTAL	**15**	**15**	**10**	**60**

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE2752: (Elective III) Analysis of Indeterminate Structure

Teaching Scheme			Examination Scheme	
Lectures	3Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	3		TA	10
			ESE	60
			Duration of ESE	03 Hrs

Course Outcomes (CO)

Student will be able to

1.	remember and understand laws and principles related to structures and systems under loading.
2.	apply methods to solve problems in structural analysis.
3.	calculate and draw response of structures under different loading conditions.
4.	predict behaviour of structures and make necessary inferences required for design.

	Course Contents	Hours
Unit 1	Energy Theorems- Bettie's Law, Maxwell's reciprocal theorem, Castiglione's theorem and unit load method. Statically indeterminate beam, truss (lack of fit and temperature variation effect), two hinged parabolic arch with supports at same level.(Degree of S.I. ≤ 2).	**(07)**
Unit 2	Displacement Method: Slope deflection method, Modified slope deflection equation application to beams, sinking of supports, portal frames without sway, with sway.	**(06)**
Unit 3	Displacement Method: Moment distribution method: application to beam, sinking of supports, portal frames without sway and with sway	**(07)**
Unit 4	Force method: Clapeyeron's theorem of three moments in continuous beam, sinking of support, beam with different. flexural rigidity	**(07)**
Unit 5	Matrix Methods: Flexibility coefficients, development of flexibility matrix, analysis of beams and portals, Stiffness coefficients, development of stiffness matrix, analysis of beams and portals (Degree of S.I. < 2)	**(07)**
Unit 6	Introduction to plastic analysis of steel structures, shape factor, plastic section modulus, upper and lower bound theorems, Plastic analysis of beams	**(06)**

Text Books

1.	BasicStructuralAnalysis: C.S.Reddy,3rd Edition, 2014 Tata McGraw Hill Publishing House, New Delhi.
2.	Structural Analysis: L. S. Negi and R.S. Jangid, Tata Mc-Graw Hills Publishing House, New Delhi
3.	Theory of Structures, by Dr. S. K. Hirde ,DrManojHedaoo, Techmax Publication.

Reference Books

1.	Timoshenko S. P. and Young D. H., (1965),Theory of Structures (2NDed),: New York :Tata McGraw Hill, New Delhi.
2	Norris, C.H., J.B. Wilbur &Utku S. (1948),Elementary Structural Analysis(1sted) , New York: TataMcGraw Hill, New Delhi.
3.	Wang C.K.(2014) ,Indeterminate Structural Analysis, New York: Tata McGraw Hill, New Delhi, ISBN – 007068135X
4.	Menon D.(2008),Structural Analysis, New Delhi :Narosa Publishing house, ISBN – 8173197504.
5.	Menon D.(2009),Advanced Structural Analysis, Narosa Publishing house,ISBN – 1842654977.
6.	Muthu K. U., Azmi I &Janadharn M.(2011),Basic Structural Analysis:. I. K International Publishing House Pvt.Ltd.
7.	Pandit& Gupta(2005), Structural Analysis- Matrix approach, (2NDed), McGraw Hillpublications,
8.	Gere & Weaver(1994), Matrix analysis of structures, Waveland press, ISBN-1577661435 .
9.	JunnarkarS. B.&Shah H.J.(2015),Mechanics of Structures(Vol-II)(24thed) :Charotar Publishers.
10.	Vazirani and Ratwani(2002),Analysis of Structures: Vol. I II, Khanna Publishers,ISBN – 8174092056

Useful Links

1.	Prof. Devdas Menon http://www.nptelvideos.in/2012/11/advanced-structural-analysis.html.
2.	Prof. P. Bannerjee http://www.nptelvideos.in/2012/11/structural-analysis-ii.html. .

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
CO 1	3	3	1	2	-	2	-	1	-	3	-	2	2	2
CO 2	2	3	1	2	3	1	1	1	1	3	1	1	2	2
CO 3	2	2	1	2	-	1	-	1	-	3	2	3	2	2
CO 4	2	2	1	2	-	1	2	2	1	3	2	2	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	2	2	2	10
Understand	2	2	2	10
Apply	7	7	2	14
Analyse	2	2	2	16
Evaluate	2	2	2	10
Create				
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE2713: (Elective IV) Earthquake Resistant Design of Structures

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	3		TA	10
			ESE	60
			Duration of ESE	03 Hrs 00 Min

Course Outcomes (CO)

Students will be able to

1.	recall and summerize basic geological concepts & fundamentals of earthquake engineering
2.	relate knowledge to solve problems in structural analyse and material testing.
3.	predict response of structure and do detailing as per standard IS codes.
4.	choose appropriate earthquake resistant system for the structure.

	Course Contents	Hours
Unit 1	**Elements of Seismology**: Terminology, structure of earth, causes of an earthquake, plate tectonic theory, continental drift theory, elastic rebound theory, seismic waves, magnitude and intensity, methods of measurement, energy released, seismograph, strong motion earthquakes, accelerogram, prominent earthquakes in India.	**(05)**
Unit 2	**Fundamentals of Theory of Vibrations:** Free and forced vibrations of single degree of freedom systems (SDOF). Undamped and viscously damped vibrations, equations of motion and solutions. General dynamic loading, Duhamel Integral, earthquake response of SDOF system	**(08)**
Unit 3	**Response Spectrum Theory:** Earthquake response spectrum, tripartite spectrum, construction of design response spectrum, effect of foundation soil and structural damping on design spectrum, evaluation of lateral loads due to earthquake on multistory buildings as per IS 1893-2002 Part I.	**(07)**
Unit 4	**Conceptual design**: Planning aspect, load path, stiffness and strength distribution, different structural system, liquefaction and settlement **Earthquake resistant design principles**: Design philosophy, behaviour of RC building, ductility and ductile detailing of beam and columns using IS 13920.	**(10)**
Unit 5	**Masonry Structures**: Behaviour of unreinforced masonry and reinforced masonry, RC bands, vertical reinforcement, openings, Provisions of IS 4326. Repair and strengthening of masonry and RC members.	**(04)**
Unit 6	**Introduction to Earthquake resistant modern techniques**: Base Isolation-Elastomeric, sliding, combined. **Seismic dampers**: Friction dampers, Tuned mass damper (TMD), Visco-elastic dampers.	**(06)**

Note: Only IS 1893 Part I is allowed in examination.

Text Books

1.	Duggal, S. K.,(2013).Earthquake Resistance Design of Structures(2nd ed.).New Delhi: Oxford University Press.
2.	Shrikhande, M.,Agarwal, P.,(2009). Earthquake Engineering(2nd ed.). New Delhi: Prentice Hall India Pvt. Ltd.
3.	Paz, M.,(2004). Structural Dynamics(2nd ed.). New Delhi: CBS Publication.
4.	Hosur, V.,(2013).Earthquake Resistance Design of Building Structures(1st ed.). New Delhi:Wiley India Pvt. Ltd. Publication.

Reference Books

1.	Chopra, A. K., (2020).Dynamics of Structures(5th ed.). New Delhi:Prentice Hall Publications.
2.	Dowrick, D. J.,(2009). Earthquake Resistant Design and Risk Reduction(2nd ed.). New Delhi:John Wiley Publication.
3.	IS 1893-2016 Part I, IS 13920, IS 4326 Bureau of Indian Standards, New Delhi.

Useful Links

1.	www.nicee.org
2.	https://nptel.ac.in/courses/105/106/105106151/

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
CO 1	1	1	1	1	-	-	1	1	-	1	-	1	3	3
CO 2	2	2	2	2	1	-	-	1	-	-	-	2	3	3
CO 3	3	2	2	2	2	-	-	1	-	1	-	2	3	3
CO 4	-	2	1	1	2	1	1	2	-	3	-	3	3	3

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	2	1	6
Understand	7	3	1	7
Apply	3	6	1	13
Analyse	0	3	3	14
Evaluate	0	0	3	15
Create	0	1	1	5
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE2723: (Elective IV) Tunnel Engineering

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	3		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to

1.	understand and apply the concepts of tunnel engineering.
2.	select and implement the methods of tunnelling.
3.	analyse the problems related to tunnel maintenance and can formulate remedial measures regarding complex maintenance issues.

	Course Contents	Hours
Unit 1	**General aspects**: - Definitions: - Tunnel, open cut, advantages and disadvantages of tunnels and open cuts. History and development in tunnel construction. Economics of tunnelling, selection of alignment of tunnel. Classification of tunnels and tunnel approaches. Introduction to under water tunnelling.	**(05)**
Unit 2	**Stages in tunnel construction:** -Investigations: - i) Investigation before planning ii) Investigation at the time of planning iii) Investigation at the time of construction. Setting out of tunnel, excavation, blasting, design of shape and size: - i) D section ii) Circular section, rectangular section iii) Horseshoe form. Methods of tunnelling (soft rock / soil): - i) Folding method ii) Needle beam method.	**(06)**
Unit 3	**Tunnelling in water bearing soils:** -Introduction, well points system. Equipment with plenum process of tunnelling or compressed air method: -i) Bulkhead ii) Airlock iii) Types of air lock.	**(05)**
Unit 4	**Tunnelling in Hard rocks:** -Introduction, sequence of operations and phases of operations for tunnelling in rock. Methods of tunnelling in rock:- i) Drift method ii) Heading and bench method iii) Full face method Mucking:-Introduction to mucking, mucking in a steep grade tunnelling. Hauling, drilling, drill hole patterns. Explosives: -PENT (Penta Enythrital), TNT (Tri-Nitro-Toluene), RDX (Rapid Detonating Explosive), Safety precautions in rock tunnelling. **Tunnelling in soft rocks:-** Fore poling method, needle beam method, shield method and its sequence of operation, merits and demerits.	**(06)**
Unit 5	**The new Austrian tunnelling method (NATM) And tunnel boring machine:** -Introduction, NATM concept. Main features of NATM, Rock bolting. Tunnel boring machine: - Introduction, types of tunnel boring machine i) slurry machine, ii) earth pressure balance machine rock machine (introduction only). Introduction to urban tunnelling and near-surface tunnelling	**(08)**
Unit 6	**Tunnel maintenance:** -Tunnelling: -Necessity, materials required, sequence of tunnel lining. Drainage of tunnels: -Introduction, free drainage, dewatering, permanent drainage. Tunnel ventilation: -Temporary ventilation, dust prevention, lighting, and permanent drainage. Health protection in tunnels: -Safety measures, health protection: -Silicosis, caisson disease.	**(07)**

Text Books

1.	R.Srinivasan, "Harbour Dock and Tunnel Engineering" Publisher:- Charotar Publishing House Pvt. Ltd.(Edition : 28th Edition : 2016 ISBN : 978-93-85039-19-5)
2.	Kumar, "Tunnel Engineering" Publisher:-Vayu Education of India, (ISBN-10 : 9383137339, ISBN-13:978-9383137336)

Reference Books

1.	David Chapman, Nicole Metje, Alfred Stark, David N. Chapman, "Introduction to Tunnel Construction" (Edition 2nd,ISBN-1498766242)
2.	Dean Brox, "Practical Guide to Rock Tunneling" Publisher:-CRC Press, (ISBN-10 : 0367782189,ISBN-13 : 978-0367782184, 1st edition (31 March 2021))
3.	Maidl, John Wiley. Publisher Wilhelm Ernst & Sohn Verlag fur Architektur und technische Wissenschaften "Handbook Of Tunnel Engineering Structures And Methods (ISBN:-9783433030486, Edition:-2nd)

4.	IS. 5878 code of practice for construction of tunnels.
Useful Links	
1.	Application of tunnel boring machine in underground mining development https://www.researchgate.net/publication/280233359_
2.	Tunnel Boring Machines in the Himalayan Tunnels https://www.researchgate.net/publication/272498361
3.	https://www.imia.com/wp-content/uploads/2013/05/TBM-WG60-f-021209.pdf

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
CO 1	1	3	3	-	3	-	1	-	-	-	-	1	2	1
CO 2	2	2	-	3	2	-	-	-	-	-	-	-	1	1
CO 3	-	-	-	2	3	-	-	-	-	-	-	-	1	1

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	-	2	12
Understand	5	5	2	12
Apply	5	5	2	12
Analyse	-	5	2	12
Evaluate	-	-	2	12
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE2733: (Elective IV) Green Building and Sustainability

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	3		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student will be able to

1.	Expose concepts of sustainability in the context of building and conventional engineered building materials.
2.	Understand energy and resources consumption and its applications.
3.	Knowledge of Energy and resources balance concept.
4.	Aware of various green building councils (OTTY), (LEED), (GRIHA) and (IGBC).

	Course Contents	Hours
Unit 1	**Introduction to sustainability and green building:** Introduction to sustainable materials and the concept of green building, comparison between conventional building and green building, Embodied energy and Operational energy in Building and Life cycle energy. Ecological footprint, Bio- capacity and calculators of planet equivalent.	**(06)**
Unit 2	**Sustainable materials:** Role of Material: Cements and cementitious material, Alternative fuel for cements for reduction in carbon emission. Sustainability issues for concrete. Role of quality, minimization of natural resource utilization, High volume fly ash concrete, geo-polymer concrete etc. concrete with alternative material for sustainability and introduction to concept of carbon minimization.	**(07)**
Unit 3	**Energy Audit and resources consumption:** Stages in energy programme, surveying the building, Measurement and Model analysis, Audit report, Reduction in water consumption in concrete Recycled aggregate, Energy for grinding and crushing of cement, aggregate etc. and reduction. Operational energy in building role of materials and thermal conductivity Clay Bricks, Types of kilns, Comparative energy performance emission performance and financial performance, Indoor air quality.	**(07)**
Unit 4	**Operational energy consumption:** Paints, Adhesive and sealants for use in building Volatile organic content (VOC) emission issues and indoor air quality for Sustainability and Health hazard. Operational energy reduction and net zero building Optimization for design of building for energy efficiency and example of optimization through use of Evolutionary genetic algorithm.	**(07)**
Unit 5	**Energy and resources balance:** Radiation budget, Surface water balance, Effects of trees and microclimatic modification through greening. Use of Building Integrated Photo Voltaic (BIPV) and other renewable energy in buildings, basic concepts and efficiency.	**(06)**
Unit 6	**Energy codes:** ECBC requirement, Concepts of Overall Thermal Transfer Value (OTTY), Green Performance rating, requirements of Leadership in Energy and Environmental Design (LEED), Green Rating for Integrated Habitat Assessment (GRIHA) and Indian Green Building Council (IGBC).	**(07)**

Reference Books

1.	Sustainability Engineering: Concepts, Design and Case Studies Allen, D. T. and Shonnard, D. R. Prentice Hall I at
2.	Engineering applications in sustainable design and development Bradley. A.S; Adebayo, A.O., Maria,
3.	Environment Impact Assessment Guidelines Notification of Government of India
4.	Basic Concepts in Environmental Management Mackenthun, K.M.Lewis Publication London
5.	GRIHA Rating System New Delhi Bureau of Energy Efficiency TERI Publications ECBC Code 2007

Useful Links

1.	https://onlinecourses.nptel.ac.in/noc19_ce40/preview
2.	https://openuped.eu/courses/details/4/447-green-building-and-sustainable-development
3.	https://www.tp.edu.sg/schools-and-courses/students/schools/eng/green-building-sustainability.html

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
CO 1	1	-	1	1	-	2	3	-	-	-	-	-	3	3
CO 2	1	2	2	1	1	1	2	-	-	-	-	1	2	2
CO 3	2	2	2	1	1	1	2	-	-	-	-	1	2	2
CO 4	-	-	1	2	2	2	2	-	-	1	2	1	3	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	2	18
Understand	4	4	5	17
Apply	1	1	2	10
Analyse	3	3	1	07
Evaluate	2	2	1	08
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE2743: (Elective IV) Municipal Solid Waste Management

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	3		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (COs)

Students will be able to

1.	understand elements of solid waste management.
2.	apply the elements of solid waste management and analyse collection, transportation, processing and disposal systems.
3.	design of processing and disposal system for effective solid waste management

	Course Contents	Hours
Unit 1	**Introduction:** Solid Waste: Sources, Types, Composition, Quantities, Physical, Chemical and Biological properties. Solid Waste Management: Objectives, Functional elements, Environmental impact of mismanagement, Factors affecting. Indian Scenario: Present scenario and measures to improve system for different functional elements of solid waste management system, Legislative provisions	**(07)**
Unit 2	**Solid Waste Generation Rate and Transfer Station:** Solid Waste Generation Rate: Definition, Typical values for Indian cities, Factors affecting. Storage and collection: General considerations for waste storage at source, Collection components, Types of collection systems. Transfer station: Meaning, Types, Capacity, Location and Viability. Transportation of solid waste: Means and methods.	**(06)**
Unit 3	**Waste Processing Techniques and Material Recovery and Recycling:** Waste Processing Techniques: Purpose, Mechanical volume and size reduction, component separation techniques. Material Recovery and Recycling: Objectives, Recycling program elements, Commonly recycled materials and processes Energy recovery from solid waste: Parameters affecting, Fundamentals of thermal processing, Biomethanation, Pyrolysis, Incineration, Refuse derived fuels, Energy recovery	**(07)**
Unit 4	**Composting of Solid Waste:** Benefits, Processes, Stages, Technologies, Factors affecting, Properties of compost. Vermicomposting	**(06)**
Unit 5	**Landfills:** Site selection, Types, Principle, Processes, Land filling methods, Leachate and landfill gas management.	**(07)**
Unit 6	**Biomedical Waste:** Generation, identification, storage, collection, transport, treatment, common treatment and disposal, occupational hazards and safety measures, biomedical waste legislation in India	**(07)**

Text Books

1.	Bhide. A.D. And Sundaresan. B.B, "Solid Waste Management", Indian National Scientific Documentation Centre, 1st Edition, 1983.
2.	CPHEEO, "Manual on Municipal Solid waste management", Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000
3.	George Tchobanoglous, "Integrated Solid Waste Management", Tata McGraw-Hill Publishing Company Limited, 1st Edition, 1993.

Reference Books

1.	Vesilind, Worrell, and Reinhart, "Solid Waste Engineering", Cengage Learning India Pvt. Ltd.,
2.	G. Masters, "Introduction to Environmental Engineering and Science", Pearson Education, 2004
3.	Peavy, Rowe and Tchobanoglous, "Environmental Engineering", Tata McGraw-Hill Publishing Company Limited, 11th Edition, 2017.

Useful Links

1.	Municipal Solid Waste Management by Prof. Ajay Kalamdhad, IIT Guwahati https://onlinecourses.nptel.ac.in/noc21_ce69/preview
2.	Integrated Waste Management for a Smart City by Prof. Brajesh Kumar Dubey, IIT Kharagpur https://onlinecourses.nptel.ac.in/noc21_ce46/preview

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
CO 1	3	-	-	-	-	-	3	-	-	-	-	-	2	2
CO 2	-	2	2	-	-	-	3	1	-	-	-	2	2	2
CO 3	-	2	3	-	-	-	3	1	1	-	-	2	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	-	2	12
Understand	5	5	2	12
Apply	5	5	2	12
Analyse	-	5	2	12
Evaluate	-	-	2	12
Create	-	-	-	-
TOTAL	15	15	10	60

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Final Year (Sem – VII) B. Tech. Civil Engineering

CE2753: (Elective IV) Coastal Engineering

Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	CT – 1	15
Tutorials	-	CT – 2	15
Total Credits	3 Hrs/week	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to

1.	identify types of offshore structures and various environmental loads acting on offshore structures.
2.	understand use of different materials for marine applications.
3.	evaluate forces on coastal structures and coastal erosion protection measures.
4.	apply knowledge coastal Engineering in inspection and testing of ocean structures.

	Course Contents	Hours
Unit 1	**Offshore structures:** Different types, Various structural systems deployed for shallow, medium, deep and ultra-deep waters, Various environmental loads acting on offshore structures, Different types of coastal structures, Brief introduction to design of offshore structures, Foundation systems for ocean structures, Sea bed anchors, Dredging methods and equipment.	**(7)**
Unit 2	**Materials for marine applications:** Types of materials and their applications in marine environment, Properties and selection of materials for marine environment, Corrosion and corrosion protection methods, Introduction to composites for marine environment, Codes of practice for materials in marine environment.	**(6)**
Unit 3	**Wave deformation :** zonation based on behaviour of waves, causes of wave deformation, important wave deformation phenomenon, refraction, diffraction and reflection of wave **Geo-synthetics :** types and applications, Breakwaters, selection of breakwater type, types and advantages, break water alignment	**(6)**
Unit 4	**Sediment characteristics :**long shore sediment transport, Radiation stresses **Forces on coastal structures :** Non-breaking wave forces **Scour under marine structure :** Importance of scour, characteristics, Scour due to steady current	**(7)**
Unit 5	**Coastal erosion protection measures** : Mechanics of sediment transport, coastal sediment budget, causes of erosion, controlling measures, protection works types, gryones, sea walls, offshore breakwaters, physical factors needed for selection, coastal defence, artificial nourishment - planning of coast protection works, Case studies.	**(7)**
Unit 6	**Inspection and testing of ocean structures**, Introduction to Non-destructive testing, Repair and rehabilitation of marine structures, Planning guidelines for maintenance of ocean structures, Structural health monitoring of ocean structures	**(7)**

Text Books

1.	API-RP2A. 1989. Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms: 18th edn. American Petroleum Institute, Washington, D.C
2.	Chakrabarti, S.K. 1987. Hydrodynamics of Offshore Structures: Computational Mechanics
3.	BS6235. 1982. Code of Practice for Fixed Offshore Structures: British Standards Institution, London.

Reference Books

1.	Narasimhan S., Kathiroli S. and Nagendra Kumar B. ―Harbour and Coastal Engineering (Indian Scenario)‖ Vol.I and II.NIOT Chennai 2002.
2.	Kamphuis, J.W., Introduction to Coastal Engineering and Management
3.	Mani J.S., Coastal Hydrodynamics. PHI Pvt.Ltd. New Delhi – 2012.
4.	Chakrabarti,S.K. 1994.Offshore Structure Modeling: World Scientific
5.	DNV 1982. Rules for the Design, Construction and Inspection of Offshore Structures: Det Norske Veritas, Oslo.

Useful Links

1.	https://nptel.ac.in/courses/114/106/114106032/
2.	https://nptel.ac.in/content/syllabus_pdf/114106035.pdf

Mapping of COs and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	1	-	1	-	-	-	-	-	1	1
CO2	3	1	-	-	-	-	-	-	-	-	1	-	1	1
CO3	1	-	2	1	-	2	2	-	-	-	-	1	1	1
CO4	-	-	2	-	2	1	-	2	1	2	-	-	1	1

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT1	CT2	TA	ESE
Remember	5	3	2	15
Understand	5	5	2	15
Apply	5	5	2	12
Analyze		2	2	9
Evaluate			2	9
Total	15	15	10	60

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Final Year (Sem – VII) B. Tech. Civil Engineering

CE2704: Design of RCC and Pre-Stressed Concrete Structures

Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	CT – 1	15
Tutorials	-	CT – 2	15
Total Credits	3	TA	10
		ESE	60
		Duration of ESE	03 Hrs 00 Min

Course Outcomes (CO)

Students will be able to

1.	understand and apply laws and principles related to different design methodologies and philosophies under loading and standard codes.
2.	apply appropriate design methods to design different structures according to standard codes.
3.	evaluate values of reactive parameters in structures under different loading conditions.
4.	predict behaviour of structures and make necessary inferences according to design.

	Course Contents	Hours
Unit 1	**Limit State of Collapse:** torsion behavior of R.C. rectangular sections subjected to torsion, design of sections subjected to combined bending and torsion, combined shear and torsion	**(07)**
Unit 2	Limit state design of two span continuous beams and three span continuous beams using is coefficient, concept of moment redistribution	**(08)**
Unit 3	**Design of water tank:** Introduction to working stress method for water tank design, design criteria, permissible stresses, design of water tank resting on ground using IS code method – (i) circular water tanks with flexible and rigid joint between wall and floor, (ii) rectangular water tanks, introduction to limit state method (LSM), IS 3370 (2009)	**(09)**
Unit 4	Basic concepts of pre-stressing, historical development, types and systems of pre-stressing, losses of pre-stress in pre tensioned and post tensioned member, flexural strength of pre-stressed concrete sections, introduction to end blocks	**(08)**
Unit 5	Analysis of pre-stressed rectangular and symmetrical I sections, different cable profiles	**(06)**
Unit 6	**Design of pre-stressed concrete:** rectangular and Symmetrical I sections for following criteria: (i) Design of section for flexure (ii) Design of section for the limit state of collapse in flexure.	**(08)**

Text Books

1.	Punmia, B. C., Jain, A.K,.(2015). *R.C.C. Design*(10th ed.). New Delhi: Laxmi Publication.
2.	Shah, V. L.,Karve, S.R.,(2014). *Limit State Theory and Design of Reinforced Concrete*(8th ed.). Pune: Structures publication.
3.	Sinha, N.C., Roy, S.K., (2013). *Fundamentals of Reinforced Concrete* (4th ed.). New Delhi: S.Chand publications.
4.	Jain, A. K.,(2012). *Reinforced Concrete: Limit State Design* (7th ed.). New Delhi: Nem Chand & brother's publication

Reference Books

1.	Varghese, P.C.,(2004). *Limit State Design of reinforced concrete*(2nd ed.). New Delhi:Prentice Hall Publications.
2.	IS 456-2000: Plain and reinforced concrete – code of practice.
3.	IS 875 (part 1): code of practice for design loads (other than earthquake) for buildings and structures. part 1: dead loads-unit weights of building materials and stored materials (second revision).
4.	IS 875 (part 2): code of practice for design loads (other than earthquake) for buildings and structures. part 2: imposed loads (second revision)
5.	IS 1343: 1980,code of practice for pre-stressed concrete.
6.	IS 3370: code of practice concrete structures for the storage of liquids
7.	SP34: 1987,handbook on concrete reinforcement and detailing

Useful Links

1.	http://nptel.ac.in/courses/105105104/
2.	https://en.wikipedia.org/wiki/Reinforced_concrete

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
CO 1	3	2	1	1	1	-	-	1	-	1	-	2	3	3
CO 2	2	3	2	2	2	1	2	1	-	1	1	1	3	3
CO 3	3	3	2	1	2	1	-	1	-	3	1	3	3	3
CO 4	3	2	2	2	2	2	3	2	1	3	2	3	3	3

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	2	1	6
Understand	6	2	1	8
Apply	4	6	1	11
Analyse	0	4	4	15
Evaluate	0	0	3	15
Create	0	1	0	5
TOTAL	15	15	10	60

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Final Year (Sem – VII) B. Tech. Civil Engineering

CE2705: Hydraulic Structures

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorial	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to

1.	explain basics of reservoir, gravity dam, earthen dam, spillway, canal, river training work and water power.
2.	apply knowledge of hydraulic structure to solve or analyze the problem associated with.
3.	design hydraulic structures in irrigation engineering

	Course Contents	Hours
Unit 1	**Dams and Reservoirs:** Types of dams, selection of site for dams, selection of type of dam, Storage Calculations using mass curves, Area elevation curve & Elevation capacity curve, Control levels, Silting of reservoirs, Control of Losses in reservoirs, Classification of Dams	**(06)**
Unit 2	**Earthen Dams:** Types of earthen dams, Components and their functions, methods of construction of earthen dam, Design criterion, plotting of phreatic line, Modes of failure, seepage control measures-Drainage & filters, stability of slopes for sudden drawdown & steady seepage, Rock fill dams **Gravity Dams:** Forces acting on dam, Design Criterion-theoretical and practical profile, high and low dam, fixing section of dam, stability analysis, and methods of construction, galleries and joints in dams. Arch dams- Introduction & types only. Introduction to instrumentation in dams.	**(08)**
Unit 3	**Spillway:** Necessity and function components of spillway, different types, factors affecting choice of type of spillway. Elementary hydraulic design, types of energy dissipation arrangements, gates for spillway. Hydrodynamics of water- Gradually varied flow(GVF),Rapidly varied flow(RVF) **Outlets in Dams:** Outlets through concrete and earth dams, different types.	**(07)**
Unit 4	**Diversion Head Works:** Component parts & their functions, types of weir and barrages, K T Weir, Causes of failure and remedies, Introduction to Theory of seepage-Bligh's creep theory, critical exit gradient, Khosla's theory	**(06)**
Unit 5	**Canals:** Types, alignment, typical sections of canals, balancing depth Kennedy's and Lacey's silt theories, canal lining-purpose, types, selection and economics. Lift Irrigation method **C.D. Works:** Necessity, Types, Canal Regulatory Works: head regulator, cross regulator, canal fall, canal escape, standing wave flume.	**(07)**
Unit 6	**River Engineering:** Classification and types of river, meandering phenomenon **River Training Works:** Classification-Marginal bunds, Guide banks and Groynes. River navigation. Interlinking of rivers, National perspective plan Methods of discharge measurement, water discharge rating curves Floods Management as changing risk, flood and ecosystem **Elements of Hydro-power Structures:** Hydro-power structures and its importance, typical layout & functions of components parts-Intakes, conveyance system, surge tanks, Power house, Tail race, Types of hydro-power plants.	**(08)**

Text Books

1.	Garg S. K.'Irrigation Engineering',Khanna Publishers, Delhi. (23rd Edition),2009
2.	Modi P. N.'Irrigation, Water Resources and Water power Engineering', Standard book house(10thEdition),2019
3.	Punmia B. C.,"Irrigation and water power Engineering", 16th edition,2009

Reference Books

1.	Grishin M.M, "Hydraulic Structures Vol. 1. & Vol. 2",Mir Publishers Moscow, 1982
2.	Design Textbook in Civil Engineering: Volume Six: Dams- Leliavsky, Serge – Oxford and IBH Publishing Co. Pvt. Ltd., 1981.
3.	Design of Small Dams- United States Department of the Interior, Bureau of Reclamation revised reprint 1974, Oxford and IBH Publishing Co.
4.	P.Novak, A. I. B. Moffat, C. Nalluri and R.Narayanan, "Hydraulic Structures", Taylor and Francis, U. K.
5.	River Behavior Management and Training ,CBIP publication.
6.	Majumdar D. K. , 'Irrigation Water Management (Principles and Practices)' Prentice Hall of India(P),Ltd(2nd Edition)2013

7.	Asawa G. L. 'Irrigation Engineering' New Age International Publishers (2nd Edition)2005
8.	Dr. Murtaza Ali, 'Land Soil and Water Resources' Koros Press Ltd(1st Edition)2015
9.	IS Code 6512: Criteria for Design of Solid Gravity Dams
10.	IS Code 7894: Code of Practice for Stability Analysis of Earth Dam
11.	IS Code 8826: Guidelines for Design of Large Earth and Rockfill Dams
12.	IS 11155 : 1994 Construction of spillways and similar overflow structures - Code of practice
13.	IS 6531 : 1994 Canal Head Regulators - Criteria for Design
Useful Links	
1.	NPTEL Course-Civil Engineering-IIT Kanpur-Water Resources Engineering by Prof. R. Srivastav-http://nptel.ac.in/courses/105/104/105104103/

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
CO 1	3	3	3	3	1	1	1	-	-	-	-	-	2	2
CO 2	3	3	3	3	3	2	1	-	-	-	-	-	2	2
CO 3	3	3	3	3	3	2	1	-	-	-	-	-	2	2

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	4	4	2	12
Understand	4	4	2	12
Apply	2	2	2	12
Analyse	2	2	2	12
Evaluate	3	3	2	12
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
CE 2716 : (Open Elective IV Lab) Advance Computing for Civil Engineering Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		**CA**	**25**
Total Credits	1			

Course Outcomes:	
Students will be able to:	
1	develop logic and algorithm for a program to serve a purpose
2	code a program
3	use the program to serve a purpose

Course Contents	
Activity 1	SQL, MS Access Fundamentals
Activity 2	Relational Query, Indexing and Hashing, Storage management, Transactions
Activity 3	MATLAB Fundamentals
Activity 4	Programming: Iterators (non-Nested), 3 Prize Problem
Activity 5	Table and Dictionary: matrix and Graphs
Activity 6	Depth First Search and Length First Search
Activity 7	Message Passing, Remote Procedure Call, Cache memory, parallelism polling, a race condition
Activity 8	Top-down and button-up approach, Decision Tree, Numerical Prediction, Classification
Activity 9	Python: Collection, File Operators, Module system
Activity 10	Stats: Basic Stats (Random Variable, Probability, Linear Regression, Hypothesis Testing, Estimation and inference,
Activity 11	Linear Algebra, Optimisation, Probabilistic Models and Distribution Family
Activity 12	Algorithm Modifications
Requirement Tools:	HTML 5, CSS, JS, SQL, Python, MATLAB
List of Submissions:	
Activity 1-12	Coding for Various Problem Statements (Civil Engineering Related)

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
CO 1	2	3	3	3	2	2	1	-	-	-	-	-	2	2
CO 2	2	3	3	2	2	2	1	-	-	-	-	-	2	2
CO 3	2	3	3	3	2	2	1	-	-	-	-	-	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

Skill Level (as per CAS Sheet)	Act 1	Act 2	Act 3	Act 4	Act 5	Act 6	Act 7	Act 8	Act 9	Act 10	Act 11	Act 12	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05	05	05
CA	25	25	25	25	25	25	25	25	25	25	25	25	25

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
CE 2726: (Open Elective IV Lab) Data Science for Civil Engineering Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2Hrs/week		**CA**	**25**
Total Credits	**1**			

Course Outcomes:	
Students will be able to:	
1	make use of DBMS
2	run basic ML Models
3	deploy and Train AI Systems

Course Contents	
Activity 1	Stats 1: Frequency distribution, Permutations and Combinations on MATLAB
Activity 2	Stats 2; Probability and Random Variables on MATLAB
Activity 3	Depth First and Breadth First
Activity 4	Heuristic Functions, Stochastic Search
Activity 5	Population-based methods: Colony Optimization, Genetic Search
Activity 6	Optimal Paths
Activity 7	Game Play & Algorithm Minimax
Activity 8	Problem Decomposition with goal trees
Activity 9	Automated domain-independent planning, partial-order planning,
Activity 10	Pattern Directed interference system, forward chaining interference system, rete system
Activity 11	Project Application: AI-based Survey and Tracking
Activity 12	Model-based diagnostics, Constraint Processing.
Requirement Tools:	Scikit Library of Python, MATLAB.
Tutorials	Practice Problems
List of Submission:	
Activity 1-8	Coding for Various Problem Statements (Civil Engineering Related)

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
CO 1	2	2	3	2	2	1	-	-	-	-	-	-	2	2
CO 2	2	3	3	2	2	1	-	-	-	-	-	-	2	2
CO 3	2	3	3	2	2	1	-	-	-	-	-	-	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

Skill Level (as per CAS Sheet)	Act 1	Act 2	Act 3	Act 4	Act 5	Act 6	Act 7	Act 8	Act 9	Act 10	Act 11	Act 12	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05	05	05
CA	25	25	25	25	25	25	25	25	25	25	25	25	25

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
CE 2717: (Elective III Lab) Remote Sensing and GIS Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		**CA**	25
Total Credits	1			

Course Outcomes:	
Students will be able to:	
1	demonstrate the satellite data in GIS software
2	use, modify and manipulate the satellite data for various applications
3	categorise the different land cover with the help of image classification tools

Course Contents	
Experiment 1	Introduction to Satellite Data. Data browsing on various platforms (Bhuvan/ USGS Explorer etc)
Experiment 2	Familiarization with Digital Image Processing
Experiment 3	Image rectification and Registration
Experiment 4	Image Enhancement
Experiment 5	Unsupervised Classification
Experiment 6	Supervised Classification
Experiment 7	Geo-referencing and Projection
Experiment 8	Spatial Data Analysis
Experiment 9	Preparation of Non-Spatial Data, Linking Spatial and Non-Spatial data
Experiment 10	Spatial and Non spatial Query and Analysis
Experiment 11	Vector Data Analysis
Note:	*Student needs perform any 8 experiments out of the above listed experiments.*
Requirement Tools :	Q- GIS Software/ Ilwis Software/ ArcGIS Software/ Erdas Imagine Software.

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
CO 1	1	1	1	1	2	1	-	-	-	-	-	-	1	1
CO 2	1	3	2	3	3	1	-	-	-	-	-	-	2	2
CO 3	1	3	3	2	3	2	-	-	-	-	-	-	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

Skill Level (as per CAS Sheet)	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	**Exp 11**	**Avg**
Task I	15	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05	05
CA/TA	25	25	25	25	25	25	25	25	25	25	25	25

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
CE2727 : (Elective III Lab) Water Power Engineering Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		**CA**	**25**
Total Credits	**1**			

Course Outcomes:	
Students will be able to:	
1	understand various parts of hydroelectric power plant.
2	analyse the performance of various turbines.
3	utilize the concepts in the course to analyse similar systems, which will acknowledge students to work together in a project related to the course content.

Course Contents	
Experiment 1	To demonstrate the model of hydroelectric power plant and draw its layout.
Experiment 2	The constructional details of kaplan turbine and draw its fluid flow chart.
Experiment 3	The constructional details of francis turbine and draw its fluid flow chart.
Experiment 4	The constructional details of pelton turbine and draw its fluid flow chart.
Experiment 5	Performance test on a Pelton Wheel Turbine
Experiment 6	Performance test on a Francis Turbine.
Experiment 7	Performance test on a Kaplan Turbine
Experiment 8	Water hammer effect in pipes.
List of Submission:	
	Submission of conducted experiments Site Visit Report

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
CO 1	3	2	1	2	2	1	2	-	1	1	2	-	1	1
CO 2	3	2	1	2	2	1	2	1	1	1	2	-	1	1
CO 3	3	3	2	2	3	2	2	1	2	1	2	1	1	1

Assessment Pattern (with revised Bloom's Taxonomy)

Skill Level (as per CAS Sheet)	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Avg**
Task I	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05
CA/TA	25	25	25	25	25	25	25	25	25

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
CE 2737 : (Elective III Lab) Ground Improvement Technique Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2Hrs/week		**CA**	**25**
Total Credits	**1**			

Course Outcomes:	
Students will be able to:	
1	conduct tests to determine both the index and engineering properties of soils.
2	apply knowledge of mathematics, science and geotechnical Engineering to solve problems in the field of modification of ground required for construction of civil engineering structures.

Course Contents	
Experiment 1	Tri-axial compression Test
Experiment 2	Study the effect of Direct Shear Stress on stabilized soil.
Experiment 3	Modified Proctor Test
Experiment 4	Plate Load Test
Experiment 5	Primary and Secondary Compression Test
Experiment 6	Collection of various types of geosynthetic material and its suitability
Experiment 7	Grab Tensile Strength of Geotextile material
Experiment 8	Grout Consistency
Experiment 9	Fibre Content test for shotcrete using washout method
Experiment 10	Flexural Toughness test for Shotcrete
Experiment 11	Site Visit 1
Experiment 12	Site Visit 2
List of Submission:	
	Submission of conducted experiments Site Visit 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	PO 12	PSO 1	PSO 2
CO 1	3	2	2	2	1	2	1	1	2	2	1	1	1	2
CO 2	3	3	3	3	2	2	2	1	2	2	-	1	1	2

Assessment Pattern (with revised Bloom's Taxonomy)

Skill Level (as per CAS Sheet)	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	**Exp 11**	**Exp 12**	**Avg**
Task I	15	15	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05	05	05
CA/TA	25	25	25	25	25	25	25	25	25	25	25	25	25

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE 2747: (Elective III Lab) Industrial Waste Treatment Lab

Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		**CA**	**25**
Total Credits	**01**			

Course Outcomes:

Students will be able to

1	understand the various characteristics of Industrial wastewater
2	understand the treatability of Industrial wastewater
3	design various chemical and Biological Treatment Units for Industrial wastewater treatment

Course Contents

Experiment 1	Testing of wastewater from different Industry (any two) [pH, BOD, COD, DO, TDS, Colour] a. Sugar and Distillery Industry b. Pulp and paper mill c. Textiles d. Tanneries e. Food Processing Industry
Experiment 2	Estimation of heavy metals in industrial effluent using Double Beam Atomic Absorption Spectrophotometer (AAS)
Experiment 3	Design of Oxidation Pond for industrial wastewater comprising biodegradable organic matter.
Experiment 4	Design of Trickling filter for Industrial wastewater treatment system
Experiment 5	Design of Primary and Secondary Sedimentation tank for Industrial wastewater treatment system.
Experiment 6	Study and Design of Common Effluent Treatment Plant for Textile Industry
Experiment 7	Design of effluent treatment plant for treatment of wastewater from different industries (any one) a. Sugar and Distillery Industry b. Pulp and paper mill, c. Tanneries, Atomic d. Food Processing Industry
Experiment 8	Visit to effluent treatment plant and common effluent treatment plant for treatment of wastewater from industries.

List of Submission:

1	Total number of Experiments- 07
2	Industrial Visit Report – 02

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
CO 1	3	1	1	1	1	2	3	1	-	2	-	1	3	3
CO 2	1	2	1	1	1	2	3	1	-	2	-	1	3	3
CO 3	1	1	3	2	2	2	3	1	1	-	-	1	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Skill Level (as per CAS Sheet)	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	**Avg**
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
CA/TA	25	25	25	25	25	25	25	25	25	25	25

Government College of Engineering, Karad					
Final Year (Sem – VII) B. Tech. Civil Engineering					
CE 2757 : (Elective III Lab)Analysis of Indeterminate Structures Lab					
Laboratory Scheme:			**Examination Scheme:**		
Practical	2 Hrs/week		**CA**	**25**	
Total Credits	**1**				

Course Outcomes:	
Students will be able to:	
1	apply methods to solve problems in structural analysis.
2	calculate and draw response of structures under different loading conditions.
3	predict behaviour of structures and make necessary inferences required for design.

Course Contents	
Experiment 1	Examples on Castiglione's theorem and unit load method for statically indeterminate beam,
Experiment 2	Examples on analysis of truss (lack of fit and temperature variation effect) and two hinged parabolic arch with supports at same level.(Degree of S.I. ≤ 2).
Experiment 3	Examples on analysis of beams, sinking of supports, portal frames with sway and non sway by using slope deflection method.
Experiment 4	Examples on analysis of beams, sinking of supports, portal frames with sway and now sway by using modified slope deflection method
Experiment 5	Examples on analysis of beams, sinking of supports, portal frames with sway by using moment distributed method.
Experiment 6	Examples on analysis of beams, sinking of supports, portal frames with non sway by using moment distributed method.
Experiment 7	Examples on analysis of beam, beam with different flexural rigidity by using Clapeyeron's three moment theorem
Experiment 8	Examples on analysis of beam with sinking of support by using Clapeyeron's three moment theorem
Experiment 9	Examples on to develop flexibility coefficient matrix, problems on analysis of beams and portal frames by using flexibility matrix method.
Experiment 10	Examples on to develop stiffness coefficient matrix, problems on analysis of beams and portal frames by using stiffness matrix method.
Experiment 11	Basic of plastic analysis of steel structures, and its examples on shape factor, plastic section modulus for beam.
Experiment 12	Examples on application of upper and lower bound theorems and examples on plastic analysis of beams.
List of Submission: Total number of experiments:- 12	

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
CO 1	2	3	1	2	3	1	1	1	-	3	1	1	2	2
CO 2	2	2	1	2	-	1	-	1	-	3	2	3	2	2
CO 3	2	2	1	2	-	1	2	2	-	3	2	2	2	2

Assessment Pattern **(with revised Bloom's Taxonomy)**

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Exp 11	Exp 12	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05	05	05
CA	25	25	25	25	25	25	25	25	25	25	25	25	25

Government College of Engineering, Karad					
Final Year (Sem – VIII) B. Tech. Civil Engineering					
CE2708 :Structural Design and Drawing II					
Laboratory Scheme:			**Examination Scheme:**		
Practical	4 Hrs/week		**CA**	25	
Total Credits	2		**ESE**	25	

Course Outcomes:	
Students will be able to:	
1	understand various members of structures, various design philosophies and connections between the structural members.
2	analyze and design the economical section of various members of steel structure as per IS code which fulfil the requirements of the client.
3	create reports and detailing of steel structures as per the client requirement to execute structure on the site.

Course Contents	
Experiment 1	Residential four (G+3) storied building (Minimum 120 Sq.m) Drawings prepared shall indicate ductility details as per the provision in IS: 13920.
Experiment 2	Any one of following: Retaining wall (cantilever or counter fort type) Design of combined footing Design of water tank resting on ground.
Experiment 3	Analysis and design of RCC framed structure using structural engineering software
List of Submission:	
	1. Required drawing sheets indicating all detailing of structural members 2. At least one drawing sheet for 2 and 3 experiment each.

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
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				
TOTAL				

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE 2709 :Seminar

Scheme:			Examination Scheme:	
Tutorial	1 Hrs/week		**TA**	25
Total Credits	01		**ESE**	25

Course Outcomes:

At the end of course students will be able to:

1	evaluate knowledge that they gain from curriculum
2	apply theoretical knowledge to practical cases in respective subjects
3	develop verbal and written presentation skills

Course Contents

The topic for the seminar may be related to Civil Engineering field such as –

1. Structural Engineering
2. Concrete Technology
3. Environmental Engineering
4. Geotechnical Engineering
5. Transportation Engineering
6. Infrastructural Engineering
7. Water Resources Engineering
8. Town & Country Planning
9. Construction Engineering
10. Surveying & Remote Sensing Techniques
11. Project Management
12. Legal Aspects in Civil Engineering
13. Earthquake Engineering
14. Disaster Management
15. Repairs and Rehabilitation of buildings
16. Engineering Geology
17. IT Applications to Civil Engineering
18. Any other relevant subject to recent development and advances in civil engineering

List of Submission:

1	Technical report in prescribed format as decided by guide

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
CO 1	1	2	1	-	2	2	2	1	1	-	2	1	1	-
CO 2	-	1	-	1	-	1	-	-	-	1	-	-	2	2
CO 3	2	-	2	2	3	-	-	2	2	2	2	2	-	1
CO 4	-	-	-	-	-	2	2	-	-	-	-	-	-	-

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CA	ESE
Remember	10	10
Understand	10	10
Apply	05	05
Analyse	-	-
Evaluate	-	-
Create	-	-
TOTAL	25	25

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech Civil Engineering

CE 2710: Industrial Training

Teaching Scheme			Examination Scheme	
Tutorial	01 Hr/week		CA	50
Total Credits	01		**TOTAL**	50

Course Outcomes (CO)

Students will

1.	possess work responsibly and ethics in their working environment.
2.	get trained in construction site related activities, communication and will get basics of site knowledge.
3.	study field practices and legal documentation in Civil Engineering.
4.	apply the theoretical knowledge for solving industrial/field challenges.

COURSE CONTENTS

Students need to choose the right area of Civil Engineering out of following discipline,

1. Construction Work.
2. Planning and Design.
3. Quantity Estimation.
4. Survey.
5. Investigations.
6. Management.

They must approach the respective authority/company through proper communication channel to obtain the permission from the authority/company and undergo field training to achieve course learning outcomes.

PERIOD OF ACTIVITY

The period of activity must be after Semester VI (Third Year B. Tech, Civil Engineering) and in summer vacation. The student has to devote 90-100 man-hours (@ 20 days) distributed over the vacations since completion of Third Year B. Tech, Civil Engineering Program.

REPORTING AND SUBMISSION REQUIREMENT

At the start of semester VIIth, the student must submit a report to mentor; based on the area they have completed for the course fulfilment. The report must be attached with certificate from appropriate authority/company, actual photographs, videos and day wise field notes. The field notes may consist of

1. Communication Records.
2. Log of Activities.
3. Work Specifications.
4. Analysis of Material.
5. Laboratories and Cost Requirements.
6. Details of billing system.
7. Regular Reporting to Mentor.
8. Certificate from Company/Organization/Firm Stating Attendance, Satisfactory Completion of Work Assigned.
9. Feedback by Employer.
10. Report Consisting of Introduction.
11. Study/Work Carried Out.
12. Observations and Outcomes.

ASSESMENT PATTERN FOR CA/TA

Student must submit finalised report at the end of the semester (VII).
Students have to present his/her work to panel of internal examiner for evaluation of CA/TA as per rubrics.

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
CO 1	-	-	-	-	3	-	3	-	-	-	-	2	3	-
CO 2	-	-	-	-	-	3	-	-	-	3	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	3	-	-	3
CO 4	3	3	3	3	-	-	-	3	-	-	-	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CA/TA
Remember	10
Understand	10
Apply	10
Analyse	10
Evaluate	10
Create	00
TOTAL	50

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Civil Engineering

CE2701: Construction Management

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

At the end of course students will be able to

1.	identify planning tools of project management
2.	understand risk management aspects of construction projects
3.	use knowledge of safety engineering in construction projects
4.	apply quality management tools to construction projects

	Course Contents	Hours
Unit 1	Project Management: Objectives, agencies, phase. Project planning, work breakdown structure. Bar chart and mile stone chart. Difference between project management and construction management	**(05)**
Unit 2	Critical Path Method (CPM): Network development, time estimates, floats, critical path. Network compression, resource allocation and network updating	**(10)**
Unit 3	Program Evaluation and Review Technique (PERT): Time estimates, slack, expected duration, probability of project completion	**(05)**
Unit 4	Risk Management in Construction Projects: Types of risks, Risk identification, analysis and mitigation, Risk reduction, avoidance and acceptance. Simulation, Decision Tree and Sensitivity analysis, occupational hazards.	**(07)**
Unit 5	Safety Engineering: Importance of safety, classification of accidents, causes of accidents, safety policy, safety plan, safety training, various safety equipment used on site, occupational hazards. Safety codes related to construction work.	**(06)**
Unit 6	Quality Management: Statistical quality control, control charts, sampling techniques. Total quality management, Quality circles, Quality Assurance (QCQA).	**(07)**

Text Books

1.	K. K. Chitkara, “Construction Project Management”, 3rd Edition, 2005
2.	Grey, Larson & Desai, “Project Management”, 4th Edition, Tata Mcgrow Hill Publications
3.	Construction Safety Manual Published by National Safety Commission of India
4.	Jhamb, “Quantitative Techniques” Volume II,

Reference Books

1.	S. Seetharaman, “Construction Engineering and Management”, 2nd edition, 2000
2.	Antil&Woodhead, “Critical Path Methods in Construction”
3.	Safety Management in Construction Industry – A Manual for Project Managers by NICMAR, Mumbai
4.	RAMP – Risk Analysis and Management of Projects by Institution of Civil Engineers and the Faculty of Institute of Actuaries, Thomas Telford Publication, London
5.	Concerned ISI for Safety in Construction – Bureau of Indian Standard

Useful Links

1.	https://swayam.gov.in
2.	https://nptel.ac.in
3.	https://www.youtube.com/user/nptelhrd
4.	https://online.stanford.edu
5.	https://www.mooc-list.com/tags/civil-engineering

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
CO 1	1	3	1	2	1	1	1	2	-	1	1	1	1	2
CO 2	2	3	2	2	2	1	1	2	3	3	3	2	1	2
CO 3	3	3	3	3	3	2	-	-	-	2	3	3	1	2
CO 4	3	3	3	3	2	1	1	3	3	3	3	3	1	2

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	-	2	12
Understand	5	5	2	12
Apply	5	5	2	12
Analyse	-	5	2	12
Evaluate	-	-	2	12
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Civil Engineering				
CE2811: (Open Elective V) MATLAB Applications in Civil Engineering				

Teaching Scheme			Examination Scheme	
Lectures	3Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	3		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to

1.	understand fundamentals and numerical analysis methods of MATLAB
2.	acquire and apply basic MATLAB programming skills for mathematical operations
3.	design and solve problems in various streams of Civil Engineering using MATLAB
4.	understand future trends in MATLAB applications

	Course Contents	Hours
Unit 1	Introduction to MATLAB Numerical Methods, Fundamentals & Numerical analysis, Field measurements, experimental investigation using MATLAB	**(06)**
Unit 2	Basic numerical techniques, Basic programming, matrix operations, Plotting – 2D, 3D,	**(06)**
Unit 3	Designing & solving Structural Engineering problems and monitoring Structural health using MATLAB Designing & solving Hydraulic Engineering problems using MATLAB	**(06)**
Unit 4	Designing & solving Geotechnical Engineering problems using MATLAB Designing Transportation monitoring & control system using MATLAB	**(06)**
Unit 5	Designing & solving Surveying & Environmental Engineering problems using MATLAB	**(06)**
Unit 6	Future trends in MATLAB applications, GPS survey, Globle positioning, IOT based systems.	**(06)**

Text Books

1.	Fausett L.V. (2007) Applied Numerical Analysis Using MATLAB, 2nd Ed., Pearson Education

Reference Books

1.	Chapra S.C. and Canale R.P. (2006) Numerical Methods for Engineers, 5th Ed., McGraw Hill

Useful Links

1.	https://onlinecourses.nptel.ac.in/noc20_ge05/preview
2.	https://nptel.ac.in/courses/105/106/105106151/
3.	http://nptel.ac.in/courses/122106033/

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
CO 1	1	1	2	1	1	-	-	-	-	-	-	1	1	1
CO 2	2	1	2	1	2	-	-	-	-	-	-	1	2	1
CO 3	1	2	2	1	2	1	-	-	-	-	-	1	1	1
CO 4	2	1	1	-	-	-	1	-	-	-	-	2	1	1

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	2	-	2	10
Understand	5	-	2	10
Apply	5	5	2	15
Analyse	3	5	2	10
Evaluate	-	5	2	15
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Civil Engineering

CE2812: (Elective V) Advanced Engineering Geology

Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	CT – 1	15
Tutorials	-	CT – 2	15
Total Credits	3	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to

1.	understand and apply the knowledge of tectonic activities in Deccan traps.
2.	acquire and apply knowledge of the preliminary geological investigations for civil engineering projects
3.	develop skills to apply geophysical methods for geological investigation of civil engineering sites.

	Course Contents	Hours
Unit 1	**Plate Tectonics and Seismicity** Introduction to the concept of plate tectonics collective explanation of seismic activity, volcanism and continental drift by plate tectonics. Lineaments: types, civil engineering significance. seismic zones of India, seismic activity of Deccan trap region, Reservoir Induced Seismicity (RIS), Tectonic nature of seismic activity of Deccan trap region	**(06)**
Unit 2	**Groundwater in Relation to Engineering Works**. Aquifer parameters, water bearing capacity of common rocks, Darcy's law, cone of depression and its significance in civil engineering, saline water intrusions: control and prevention. Systematic groundwater investigation. Occurrence of groundwater in Deccan trap region. Water Pumping Tests: approach and utility, influence of subsurface water in engineering constructions, case study on ground water problems and its solution	**(06)**
Unit 3	**Application of Rock Mechanics in Engineering** Introduction, relevance of rock mechanics in evaluating rock and rock mass properties, measurement of strength of intact rock, elastic properties of rocks, measurement of stress in underground rocks, estimation of rock mass properties, introduction to basalt fibre.	**(06)**
Unit 4	**Site Investigation** Introduction, different stages of site investigation, aerial photography interpretation and satellite remote sensing, geophysical exploration, subsoil exploration and sampling of soils, methods of subsoil exploration, exploratory drilling in rocks. Engineering consideration of structural features	**(06)**
Unit 5	**Engineering Geology considerations for**: **Dam:** Influence of geomorphology and geology in the design of a dam, adverse effects of faults in dam Foundation and its treatment, causative factors of dam disasters, Preliminary investigation and selection of a dam site **Tunnel:** Geological hazards in tunneling **Bridge:** Supports and foundations of bridges, different aspects of engineering geological investigation of a bridge site, locating a bridge at different reaches of a river, bridge sites in alluvial plains, bridge foundation in subsoil in relation to depth of scouring, case studies on bridges including a collapsed bridge	**(08)**
Unit 6	**Natural Hazard: Landslide** Introduction, hazards of landslides, landslide type: classification and description, causes of landslides, investigation of areas affected by landslides and slide-prone areas, Landslide Hazard Zonation mapping, Landslide Hazard Mitigation, concept of Glacial Lake Outburst Flood (GLOF), instances of major landslides in India, case study on landslides in India in recent past	**(07)**

Text Books

1.	Parbin Singh, 'Engineering & General Geology' S.K.Kataria and Sons., 1997
2.	S. Gangopadhyay 'Engineering Geology' Oxford University Press, 2013
3.	N ChennaKesavulu 'Textbook of Engineering Geology', Laxmi Publications, 2013

Reference Books

1.	D.K. Todd, 'Groundwater Hydrology', John Wiley & Sons, 1993.
2.	A. C Waltham, 'Foundations of Engineering Geology', Blackie Academic & Professional, Chapman & Hall, First Edition, 1997.
3.	Krynine& Judd, 'Principles of Engineering Geology and Geotechnics', CBS Publishers and Distributors., 2003
4.	M.B.Billings, 'Structural Geology', Prentice Hall, INC , 1961

Useful Links			
1.	http://nptel.ac.in/courses/105105106/Dr. DebasisRoy IIT Kharagpur		
2.	http://nptel.ac.in/courses/105104152/Prof. Javed N. Malik IIT Kanpur		
3.	http://nptel.ac.in/courses/105104156/Prof. Javed N. Malik IIT Kanpur		

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
CO 1	1	1	1	1	1	2	1	-	-	-	-	1	1	1
CO 2	1	1	1	1	2	2	1	-	-	-	-	1	2	1
CO 3	1	2	1	1	1	2	1	-	-	-	-	1	2	1

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	15
Understand	5	5	3	15
Apply	5	5	3	15
Analyse	-	-	1	15
Evaluate	-	-	-	-
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Civil Engineering

CE2822: (Elective V) Professional Practices in Civil Engineering

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	3		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student will able to

1.	describe functioning/working of different types of industries/sectors in Civil Engineering.
2.	describe drawings and documents required and used in different Civil Engineering works.
3.	understand the importance of Code, Acts, Laws and Ethics to be practiced by a Civil Engineer and also understand the duties and responsibilities as a Civil Engineer.
4.	understand different health and safety practices on the site.

	Course Contents	Hours
Unit 1	**Professional Practice and Administration contracts:** The standard form of building contracts. The right of building owner, Third parties, Indian contract Act, Real Estate (Regulation and Development) Act, 2016 (RERA), Sale of Goods Act, Professional Ethics.	**(07)**
Unit 2	**Arbitration and Award:** Indian Arbitration Act, Arbitration Agreement, Conduct of Arbitration, Power and Duties of Arbitrator, Rules of Evidence, Preparation and publication of award, Methods of Enforcement impending and Awards.	**(06)**
Unit 3	**Drawings and Documents** Types of drawings in different construction projects. Contract agreement & other documents in different construction projects. **Industrial Act and Labour Laws-** Industrial Dispute Act, Payment of wages Act and Child Labour Act.	**(07)**
Unit 4	**Engineering Ethics** Introduction, moral issues and moral dilemmas. Code of ethics in Civil Engineering followed by Construction Industry Development Council (CIDC) of India, national & international associations and institutes. Effective case studies (Minimum 1 case studies).	**(07)**
Unit 5	**Construction Site Safety** Importance of site safety. Different health and safety parameters during actual execution of Civil Engineering constructions. Safety measures: conventional and modern.	**(06)**
Unit 6	**Sectors in Civil Engineering** Details of different Sectors/sub-disciplines in Civil Engineering along with the following details: description, eminent institutes in India & abroad, related research institutes, noteworthy projects, higher education, latest & ongoing research in the domain, jobs opportunities in government as well as private sector.	**(07)**

Reference Books

1.	Krishnamurti K. G, "Professional Practice",Prentice Hall India Learning Private Limited (2019)
2.	B. S. Patil, "Legal Aspects of building and Engineering Contracts", Orient Blackswan Private Ltd; 6th edition, 2015
3.	B. S. Patil, "Indian arbitration Act", 6th Edition, 1996
4.	Indian Contract Act,1872
5.	Safety Engineering, Govt. of India Publicaiton,2020

Useful Links

1.	Dr. K. C. Ayer http://www.nptel.ac.in/syllabus/105102013/

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
CO 1	2	1	1	2	2	1	-	2	-	-	-	1	3	2
CO 2	2	1	2	1	2	-	-	1	-	-	-	1	2	3
CO 3	1	1	-	1	-	2	-	3	-	-	-	1	2	3
CO 4	2	-	-	-	2	3	-	1	-	-	-	1	3	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	2	18
Understand	4	4	5	17
Apply	1	1	2	10
Analyse	3	3	1	07
Evaluate	2	2	1	08
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Civil Engineering

CE2832: (Elective V) Traffic Engineering

Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	CT – 1	15
Tutorials	0 Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

At the end of course students will able to

1.	identify traffic characteristics and its components, factors affecting road traffic.
2.	understand traffic movements and speed studies.
3.	perform various types of traffic surveys, data collection, analysis, inference and presentation
4.	evaluate various modes of Mass Transportation like Bus and Rail and its Planning and Management

	Course Contents	Hours
Unit 1	Traffic Characteristics Traffic characteristics –Road user characteristics, General human characteristics, Physical characteristics. Vision eye – Movement peripheral vision, Visual attention, Visual sensitivity to light and colour, glare vision and recovery perception of space. Hearing, Stability sensation,	**(6)**
Unit 2	Time factor in response, Theory of PIEV modifying factors, conditional responses; Vehicular Characteristics –types, dimensions, resistance, power requirement for different resistance, change in direction –minimum turning radius, off tracking, slip angle	**(6)**
Unit 3	Traffic Engineering & Speed Analysis Introduction, Speed studies, journey time and delay studies, Sampling in traffic studies & application, Traffic surveys-types of volume count Planning, Problems on PCU, moving observer method and spot speed. Traffic operation and management. Traffic systems management and Travel demand management –Congestion Management Cost effective management measures, Traffic control aids, Street furniture, Road Arboriculture–Traffic Regulation, Traffic Sign and Road marking	**(8)**
Unit 4	Trip Generation and Distribution: Factors governing trip generation and attraction –Application of Regression Analysis-Methods of trip distribution; Growth and Synthetic Models Calibration and Application of gravity model.-Category analysis	**(6)**
Unit 5	Introduction to Intelligent Transportation Systems (ITS) Definition, Objectives, Historical Background, Benefits of ITS -ITS Data collection techniques –Detectors, Automatic vehicle location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), Video data collection. Advanced traffic management systems (ATMS), Advanced traveller information Systems (ATIS), Commercial vehicle operations (CVO), Advanced vehicle control systems (AVCS), Advanced Public transportation systems (APTS), and Advanced rural transportation systems (ARTS).	**(7)**
Unit 6	Public Transport System History and role of Transit, Transit system and transit mode characteristics, Transportation technology Vision–2020, Role of various modes of Mass Transport and their Impact, Indian condition Bus Rapid Transit Systems (BRTS)-Rapid transit rail-Metro & Mono rails	**(7)**

Text Books

1.	Kadiyali L.R. Traffic Engineering and Transport planning, Khanna Tech Publishers, 2011
2.	Khanna O.P and Justo C.G; Highway Engineering, Nem Chand Publishers, 9e.
3.	Donald Drew, Traffic Flow Theory Chapter 14 in Differential Equation Models, Springer, 1983

Reference Books

1.	Black John ,“Urban Transportation Planning”, Croom Helm Ltd. London, 1981
2.	“Urban Transportation Planning: General Information and Introduction to System 360”, Bureau of Public Roads, Washington D.C ,1970
3.	Bruton M.J. and Hutchinson, “Introduction to Transportation Planning”, 2nd edition, London, 1975
4.	Drew D.R., “Traffic Flow Theory and Control”, McGraw-Hill, New York, 1968
5.	Hutchinson B.G., “ Principles of Urban Transport Systems Planning”, McGraw-Hill Book Co., New York, 1974

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
CO 1	1	3	3	-	3	-	1	-	-	-	-	1	2	1
CO 2	2	2	-	3	2	-	-	-	-	-	-	-	1	1
CO 3	-	-	-	2	3	-	-	-	-	-	-	-	1	1

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	-	2	12
Understand	5	5	2	12
Apply	5	5	2	12
Analyse	-	5	2	12
Evaluate	-	-	2	12
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Civil Engineering

CE2842: (Elective V) Bridge Engineering

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	3		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student will be able to

1.	understand and apply design loads in analysis of bridges as per load classes given in IRC.
2.	apply design considerations of various components of bridges.
3.	compare and apply various techniques used in the construction of bridges.
4.	select, analyse and design different types of bridge bearings.

	Course Contents	Hours
Unit 1	**Fundamentals of Bridges:** Standard specifications for Road Bridges. I.R.C. bridge code, width of carriage way, clearances, loads to be considered. **Bridge Hydrology:** Determination of design discharge, linear water way, economical span, location of piers and abutments, afflux, scour depth, design problems.	**(07)**
Unit 2	Aesthetics of bridges, general design considerations for R.C.C. & P.S.C. bridges, Traffic aspects for highway bridges.	**(06)**
Unit 3	Design of reinforced concrete deck slab using Pigeaud'stheory, beam and slab and T – beam, Courbon's theory.	**(07)**
Unit 4	**Design of sub structure:** Abutments, Piers, well foundation, approach slab.	**(06)**
Unit 5	**Construction Techniques:** Construction of sub-structure footing, piles, caissons, construction of reinforced earth retaining wall and reinforced earth abutments, super structure erection method for bridge deck construction by cantilever method.	**(07)**
Unit 6	Different types of bridge Bearing and expansion joints –forces on bearings, Types of bearings, design of unreinforced elastomeric bearings, expansion joints Repair, Strengthening, and Rehabilitation of Existing Bridges	**(07)**

Text Books

1.	Bindra S. P., "Principles and Practice of Bridge Engineerimg", DhanpatRai Publications, 8th Edition, 2012.
2.	Victor D. J., "Elements of Bridge Engineering", Oxford and IBH, 5th Edition, 2001.
3.	S. PonnuSwamy, "Bridge Engineering", Tata McGraw-Hills Publishing Company Limited, 2nd edition, 2007.

Reference Books

1.	Alagia J. S., Rangwala S. C., "Elements of Bridge Engineering", Charotar Publishing House, 8th Edition, 1983.
2.	Dr V. K.Raina, "Concrete Bridge Practice, Analysis, Design and Economics", Tata McGraw- Hills Publishing Company Limited, 2002
3.	N. Krishna Raju, "Design of Bridges", Oxford & IBH Publishing Co. Pvt Ltd., New Delhi, 4th edition, 2001.

Useful Links

1.	Reinforced Concrete Road Bridges, By Prof. Nirjhar Dhang ,IIT Kharagpur. https://onlinecourses.nptel.ac.in/noc21_ce43/preview

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
CO 1	3	2	1	1	1	-	-	1	-	1	-	2	3	3
CO 2	2	3	1	2	1	-	1	1	1	-	1	1	3	3
CO 3	3	2	2	1	3	1	-	1	-	2	1	3	3	3
CO 4	2	2	3	2	2	2	3	2	-	2	2	3	3	3

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	2	1	6
Understand	6	2	1	8
Apply	4	6	1	11
Analyse	0	4	4	15
Evaluate	0	0	3	15
Create	0	1	0	5
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Civil Engineering

CE2852: (Elective V) Advanced Design of Concrete Structures

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

Course Outcomes (CO)

Student will be able to:

1.	learn analysis and design of different types of RC structures.
2.	understand behaviour of special RC structures under various loads and load combinations.
3.	carryout design and detailing of reinforcement in special RC structures.
4.	learn application of different IS code specifications for design of R C structures.

	Course Contents	Hours
Unit 1	Design of Flat Slabs: analysis and design of flat slab, Direct design method, Equivalent frame method, detailing of reinforcement as per Codal provisions.	**(07)**
Unit 2	Analysis of Deep Beams: design of simply supported and continuous deep beam as per Codal provision,	**(06)**
Unit 3	Design of Chimney: analysis of stresses in RCC chimney- uncracked and cracked sections, Codal provisions, design of chimney.	**(07)**
Unit 4	Design of Overhead Water Tanks: rectangular and circular water tank with flat bottom, rectangular and circular base slab, flat and dome shaped tank roof, design based on IS 3370	**(07)**
Unit 5	Shear walls : Types of shear walls, analysis and Design, ductile detailing of shear wall as per codes.	**(07)**
Unit 6	Yield line analysis of slabs: virtual work and equilibrium method of analysis, design of simply supported rectangular slabs	**(06)**

Tutorials: Assignment on each unit is to be solved and submitted by the student

Text Books

1.	V. L. Shah and S.R. Karve, “Limit State Theory and Design”,Structures publications,8 th edition, 2014
2.	N Krishna Raju, “Advanced Reinforced Concrete Design”,CBS publishers and distributors, 2 ndedition, 2010
3.	Ramamrutham, “Design of Reinforced Concrete Structures”, Dhanpatrai& son’s publication,9 th edition, 1981

Reference Books

1.	P Purushothaman, “Reinforced Concrete Structural Elements”, Mc-Grawhill publishing co.,3 rd. edition, 2004
2.	A. K. Jain, “Reinforced Concrete: Limit State Design”,Nem Chand & bros. publications, 7 th edition, 2012
3.	Taylor C Pere, “Reinforced Concrete Chimneys”,Laxmi publications,7 th edition, New Delhi
4.	Jones LL&Thomas and Hudson, “Yield Line Analysis of Slabs”, Chatto &windus Publisher, London, 1967
5.	Design of deep girders, Concrete Association of India
6.	Code of practice IS 456-2000, Plain and reinforced concrete
7.	IS 3370: code of practice concrete structures for the storage of liquids
8.	Pankaj Agarwal and Manish ShriKhande, Earthquake Resistant Design of Structures, Prentice- Hall of India, 2007, New Delhi, 2007
9.	Bullen K.E., Introduction to the Theory of Seismology, Great Britain at the University Printing houses, Cambridge University Press 1996.

Useful Links

1.	http://nptel.ac.in/courses/105105104/
2.	https://en.wikipedia.org/wiki/Reinforced_concrete

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
CO 1	3	2	1	1	1	-	-	1	-	1	-	2	3	3
CO 2	2	3	2	2	2	1	2	1	-	1	1	1	3	3
CO 3	3	3	2	1	2	1	-	1	-	3	1	3	3	3
CO 4	3	2	2	2	2	2	3	2	1	3	2	3	3	3

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	1	1	1	06
Understand	2	2	1	06
Apply	3	3	2	12
Analyse	3	3	2	12
Evaluate	3	3	2	12
Create	3	3	2	12
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Civil Engineering				
CE 2813 : (Open Elective V Lab) MATLAB Applications In Civil Engineering Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		**CA**	**50**
Total Credits	**01**			

Course Outcomes:	
Students will be able to	
1	understand fundamentals and numerical analysis methods of MATLAB
2	acquire and apply basic MATLAB programming skills for mathematical operations
3	design and solve problems in various streams of Civil Engineering using MATLAB
4	understand future trends in MATLAB applications

Course Contents	
Task 1	Introduction to MATLAB Programming, Fundamentals & Numerical analysis
Task 2	Field measurements using MATLAB
Task 3	experimental investigation using MATLAB
Task 4	Basic programming, matrix operations
Task 5	Plotting – 2D, 3D
Task 6	Designing & solving Structural Engineering problems
Task 7	Monitoring Structural health using MATLAB
Task 8	Designing & solving Hydraulic Engineering problems using MATLAB
Task 9	Designing & solving Geotechnical Engineering problems using MATLAB
Task 10	Designing Transportation monitoring & control system using MATLAB
Task 11	Designing & solving Surveyingproblems using MATLAB
Task 12	Designing & solving Environmental Engineering problems using MATLAB
Requirement Tools :	MATLAB software
List of Submission:	
	Practicals of MATLAB applications in Civil Engineering

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
CO 1	1	1	2	1	1	-	-	-	-	-	-	1	1	1
CO 2	2	1	2	1	2	-	-	-	-	-	-	1	2	1
CO 3	1	2	2	1	2	1	-	-	-	-	-	1	1	1
CO 4	2	1	1	-	-	-	1	-	-	-	-	2	1	1

Assessment Pattern (with revised Bloom's Taxonomy)

Skill Level (as per CAS Sheet)	**Task 1**	**Task 2**	**Task 3**	**Task 4**	**Task 5**	**Task 6**	**Task 7**	**Task 8**	**Task 9**	**Task 10**	**Task 11**	**Task 12**	**Avg**
Task I	30	30	30	30	30	30	30	30	30	30	30	30	30
Task II	10	10	10	10	10	10	10	10	10	10	10	10	10
Task III	10	10	10	10	10	10	10	10	10	10	10	10	10
CA/TA	50	50	50	50	50	50	50	50	50	50	50	50	50

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
CE2804 : Software Laboratory				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		**CA**	**50**
Total Credits	**1**		**ESE**	**50**

Course Outcomes:	
Students will be able to	
1	understand the suitability and applications of various Civil Engineering Softwares available.
2	plan, design and estimate project using modern softwares.

Course Contents	
Experiment 1	Introduction to various Civil Softwares
Experiment 2	Introduction to ETABS, SAP 2000 & STAAD PRO Softwares
Experiment 3	Analysis and design of various structures such as multi-storey framed structures, bridges Water Tank etc. By using ETABS
Experiment 4	Analysis and design of various structures such as multi-storey framed structures, bridges, intze tank etc. By using SAP 2000
Experiment 5	Analysis and design of various structures such as multi-storey framed structures, bridges, intze tank etc. By using STAAD PRO Software
Experiment 6	Plotting of Graphical design of various Structural members by using AutoCAD Revit Architecture suite
Experiment 7	Analysis and design of various steel structures by using Auto CAD Revit Structure suite
Experiment 8	Use of Project Management Software - MS Project
Experiment 9	Preparation of Bar Chart/Gantt Charts/CPM/PERT Charts and finding Critical Path
Experiment 10	Use of Project Management Software - Primavera
Experiment 11	Practice on Resource allocation and Project Monitoring (Cost and Time)
Experiment 12	Analysis and design of various structures such as multi-storey framed structures, bridges Water Tank etc. By using ETABS
Requirement Tools :	Civil Engineering Softwares
List of Submission:	
	Any 9 experiments

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
CO 1	3	2	-	1	2	1	-	-	1	-	1	1	1	1
CO 2	3	2	2	2	2	2	1	-	1	1	2	2	2	1

Assessment Pattern (with revised Bloom's Taxonomy)

Skill Level (as per CAS Sheet)	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	**Exp 11**	**Exp 12**	**Avg**
Task I	30	30	30	30	30	30	30	30	30	30	30	30	30
Task II	10	10	10	10	10	10	10	10	10	10	10	10	10
Task III	10	10	10	10	10	10	10	10	10	10	10	10	10
CA/ESE	50	50	50	50	50	50	50	50	50	50	50	50	50

Government College of Engineering, Karad					
Final Year (Sem – VIII) B. Tech. Civil Engineering					
CE2805 :Project					
Laboratory Scheme:			**Examination Scheme:**		
Practical	20 Hrs/week		**CA**	**200**	
Total Credits	**10**		**ESE**	**200**	

Course Outcomes:

Students will be able to

1	perform detail literature survey on the research topic of work.
2	carry out detailed mathematical modelling or experimental validation.
3	draw inferences from the findings and present conclusion.
4	possess presentation and technical report writing skills.

Course Contents

The project may be a design project, experimental project, field surveying or computer oriented on any of the topics of civil engineering interest. Project group consists of a minimum THREE and maximum FIVE students. The group is required to do literature survey, formulate the problem, propose and execute methodology.

Students will prepare a technical report in prescribed format based on their work.

The assessment of the project will be done at the end of the semester by a committee consisting of three faculty members from the department along with Project Guide. The students will present their project work before the committee. The presentation of the project shall be of 45min followed by viva voce.

The project guide will award the marks to the individual students depending on the group average awarded by the committee.

One Project Guide shall be allotted maximum TWO groups for guidance. Each group will submit the copies of the completed project report. One copy will be kept in the departmental library.

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
CO 1	-	1	1	1	3	2	2	1	3	2	3	3	1	3
CO 2	2	3	3	3	3	3	3	1	3	2	3	3	2	3
CO 3	3	3	2	3	3	3	3	3	3	1	3	3	2	3
CO 4	1	-	1	-	3	1	1	1	3	3	3	3	2	3

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CA	ESE
Remember	36	36
Understand	36	36
Apply	36	36
Analyse	36	36
Evaluate	36	36
Create	20	20
TOTAL	200	200

Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Civil Engineering				
CE2806 : MOOC-1				
Laboratory Scheme:			**Examination Scheme:**	
Practical	---Hrs/week		**CA**	---
Total Credits	**04**		**ESE**	---

Course Outcomes:	
Students will be able to	
1	evaluate knowledge that they gain from MOOC.
2	apply theoretical knowledge to practical cases in learned subjects.

Course Contents

Students are instructed to register for online MOOC available on platforms like NPTEL,MOOC, Coursera etc. and course must be of minimum 12 weeks. **Combination of weeks may be (8+4) / (4+4+4) /12 week single course.**

The student will give a detailed presentation based on courses completed, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:
• Quality of content presented.
• Proper planning for presentation.
• Effectiveness of presentation. Etc.

Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Civil Engineering				
CE2807 : MOOC-2				
Laboratory Scheme:			**Examination Scheme:**	
Practical	---Hrs/week		**CA**	---
Total Credits	**04**		**ESE**	---

Course Outcomes:	
Students will be able to	
1	evaluate knowledge that they gain from MOOC.
2	apply theoretical knowledge to practical cases in learned subjects.

Course Contents

Students are instructed to register for online MOOC available on platforms like NPTEL,MOOC, Coursera etc. and course must be of minimum 12 weeks. **Combination of weeks may be (8+4) / (4+4+4) /12 week single course.**

The student will give a detailed presentation based on courses completed, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria:
• Quality of content presented.
• Proper planning for presentation.
• Effectiveness of presentation. Etc.

Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Civil Engineering				
CE2808 : Industry Project				
Laboratory Scheme:			**Examination Scheme:**	
Practical	---Hrs/week		**CA**	**200**
Total Credits	**10**		**ESE**	**200**

Course Outcomes:

Students will be able to

1	decide which profession of the industry would be better as a career option to pursue.
2	acquire practical experience in an organizational setting.
3	develop communication and teamwork skills.
4	create network and social circle and develop relationships with industry people.

Course Contents

The general procedure for arranging internship is given below:
i. Request Letter/ Email from students / college. Students request letter/profile/ interest areas may be submitted to industries for their willingness for providing the training.
ii. Industry will confirm the training and the number of seats allocated for internships via Confirmation Letter/ Email. In case the students arrange the training themselves the confirmation letter will be submitted by the students in the office of Training & Placement through concerned department. Based on the number of vacancies agreed to by the Industry, Head / TPO will allocate the students to the Industry. In addition, the internship slots may be conveyed through Telephonic or Written Communication (by Fax, Email, etc.) by the Head / TPO or other members of the T&P cell / Faculty members who are particularly looking after the Final/Summer Internship of the students.
iii. Students on joining Training at the concerned Industry / Organization, submit the Joining Report/ Letters / Email.
iv. Students undergo industrial training at the concerned Industry / Organization. In-between Faculty Member(s) evaluate(s) the performance of students once/twice by visiting the Industry/Organization and Evaluation Report of the students is submitted in department office/TPO with the consent of Industry persons/ Trainers.
v. Students will submit training report after completion of internship.
vi. Training Certificate to be obtained from industry.

Internship Company Norms:
Company where students intend to do internship should be
1. Should be registered company
2. Preferably be ready to have MoU with GCE Karad
3. Should communicate institute about selection and period of internship.
4. Should allow GCEK teachers / mentors to visit company for performance evaluation and discussion
5. Should share student's attendance while in internship
6. Should allow students to visit institute once in month or agreed by Head of Department.

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
CO 1	-	1	1	1	3	2	2	1	3	2	3	3	1	3
CO 2	2	3	3	3	3	3	3	1	3	2	3	3	2	3
CO 3	3	3	2	3	3	3	3	3	3	1	3	3	2	3
CO 4	1	-	1	-	3	1	1	1	3	3	3	3	2	3

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CA	ESE
Remember	36	36
Understand	36	36
Apply	36	36
Analyse	36	36
Evaluate	36	36
Create	20	20
TOTAL	200	200

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
Audit Course Lab I: CE2714: Foundations of Data Science and Machine Learning Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-

Prerequisite : Mathematics, Basic Programming skills

Course Outcomes (CO): Students will be able to

CO1	Analyze and visualize data using statistical methods and tools to extract meaningful insights.
CO2	Implement and manage efficient data storage, retrieval, and preprocessing for decision-making.
CO3	Develop and evaluate machine learning models and neural networks to solve complex problems.
CO4	Utilize cloud computing resources and ensure ethical considerations in the design of AI systems.

Course Contents		CO
Implementation of following concepts		
Experiment 1	Data visualization effectiveness evaluation with Python and Tableau	**CO1**
Experiment 2	Real-world dataset exploratory analysis using Python /R	**CO1**
Experiment 3	Common data cleaning challenges and solutions using Python and SQL	**CO2**
Experiment 4	Database performance optimization strategies assessment.	**CO2**
Experiment 5	Machine learning algorithm performance comparison using TensorFlow, PyTorch, and scikit-learn	**CO3**
Experiment 6	Machine learning model monitoring framework development using TensorFlow Serving and Prometheus	**CO3**
Experiment 7	Neural network architecture comparison for image classification tasks using TensorFlow and PyTorch with and without Hyperparameter tuning	**CO3**
Experiment 8	Transfer learning techniques implementation and evaluation	**CO3**
Experiment 9	Scalability assessment using containerization technologies like Docker and Kubernetes.	**CO4**
Experiment 10	Serverless architecture implementation and efficiency evaluation.	**CO4**
Experiment 11	Bias detection experiments using fairness metrics and diverse datasets and Fairness-aware model training techniques exploration	**CO4**
Experiment 12	Regulatory compliance analysis and strategies development	**CO4**
List of Submission:		
Minimum No. of Experiments: 10		

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	PSO1	PSO2
CO 1	2	3	3	3	3	1	-	-	-	-	-	2	-	2
CO 2	2	2	2	2	3	2	-	-	2	2	2	2	1	-
CO 3	3	3	3	3	3	-	1	2	1	2	3	2	-	1
CO 4	2	3	2	3	3	2	2	2	2	2	1	2	2	-

1: Slight(Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
Audit Course Lab I: CE2724: AIoT Development Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
Prerequisite : Mathematics, Basic Programming skills				
Course Outcomes (CO): Students will be able to				
CO1	Understand the fundamentals of IoT hardware and software.			
CO2	Develop proficiency in programming and simulating IoT devices.			
CO3	Gain knowledge of artificial intelligence concepts and their integration with IoT systems.			
CO4	Explore the practical applications and implications of IoT technologies in various domains.			

Course Contents		**CO**
Implementation of following concepts		
Experiment 1	Familiarization with IoT development kits (e.g., Raspberry Pi, Arduino, ESP32)	**CO1**
Experiment 2	Understanding the components and capabilities of IoT hardware platforms	**CO1, CO2**
Experiment 3	Exploring different types of sensors (temperature, humidity, motion, light, etc.)	**CO2,CO3**
Experiment 4	Hands-on exploration of actuators (motors, servos, relays) and their applications in IoT	**CO1**
Experiment 5	Using IoT Circuit Designing Software to build circuits with drag & drop features	**CO4**
Experiment 6	Programming IoT devices using Block Designer Software	**CO1**
Experiment 7	Simulating IoT circuits in a virtual environment	**CO2**
Experiment 8	Hands-on practice with IoT development boards and sensors	**CO4**
Experiment 9	Programming AI models using Block Designer Software	**CO3**
Experiment 10	Implementing Python scripts for data analysis and AI applications	**CO2, CO3**
Experiment 11	Integrating AI models with IoT devices for smart solutions	**CO1**
Experiment 12	Overview of Artificial Intelligence (AI) and its applications	**CO4**
Experiment 13	Introduction to the Internet of Things (IoT) and its significance	**CO2**
Experiment 14	Understanding the concept of Artificial Intelligence of Things (AIoT)	**CO3**
Experiment 15	Exploring the role of IoT gateways in bridging mobile devices and IoT networks	**CO4**
Experiment 16	Techniques for establishing seamless connections between mobile devices and IoT gateways	**CO1**
Experiment 17	Hands-on exercises demonstrating the setup and configuration of mobile-to-IoT connections	**CO4**
Experiment 18	Overview of sensor technologies commonly used in IoT applications	**CO3**
Experiment 19	In-depth exploration of various types of sensors and their academic underpinnings	**CO1**
Experiment 20	Practical demonstrations showcasing the functionality and applications of sensors in IoT systems	**CO4**
List of Submission:		
Minimum No. of Experiments: 18		

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	PSO1	PSO2
CO 1	2	3	3	2	2	2	-	-	2	2	2	3	2	2
CO 2	2	3	2	2	2	2	-	-	3	2	2	3	2	1
CO 3	2	2	3	2	2	2	-	-	2	2	2	2	-	1
CO 4	2	2	2	3	2	2	1	2	3	2	2	3	2	-

1: Slight(Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
Audit Course Lab I: CE2734: Immersive Game Development Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
Prerequisite : Mathematics, Basic Programming skills				
Course Outcomes (CO): Students will be able to				
CO1	Apply Unity and 3D content creation basics for virtual environment design.			
CO2	Analyse Unity animations and physics for engaging gameplay.			
CO3	Synthesize UI/UX design and scripting for user-friendly Unity interfaces.			
CO4	Design, optimize, and deploy AR/VR experiences in Unity with audio-visual enhancements.			

Course Contents		CO
Implementation of following concepts		
Experiment 1	**Real-time Rendering Comparison** • Understand real-time rendering and compare it with offline rendering. • Research and present the concept of real-time rendering, • Discuss the importance of optimization in real-time rendering.	**CO1**
Experiment 2	**Unity Interface Exploration** • Explore Unity's interface and features, • Experiment with various tools available in Unity. • Create a simple scene and organize objects within it.	**CO1**
Experiment 3	**Introduction to 3D Modelling** • Learn basics of 3D modelling. • Understand fundamental 3D modelling concepts, tools, and techniques. • Practice creating basic 3D models using modelling software.	**CO1**
Experiment 4	**Animation Basics in Unity** • Understand animation concepts and tools in Unity. • Learn about key frame animation, skeletal animation, and animation blending. • Create simple animations for objects and characters in Unity.	**CO2**
Experiment 5	**Unity's Physics Engine** • Introduction to Unity's physics engine. • Learn about Unity's physics components like Rigid body, Collider, and Physics materials. • Implement basic physics interactions in Unity scenes.	**CO2**
Experiment 6	**UI Design and Scripting** • Learn UI/UX design principles and basic scripting in Unity. • Create UI elements using Unity's UI system. • Learn basics of C# programming language and Write scripts for UI interactions and applications.	**CO3**
Experiment 7	**Audio and Visual Effects Implementation** • Add audio assets and visual effects to Unity projects. • Implement sound effects, background music, and spatial audio. • Incorporate visual effects using Unity's VFX Graph.	**CO3**
Experiment 8	**Unity Project Optimization** • Learn techniques for optimizing Unity projects. • Implement LOD (Level of Detail), batching, and occlusion culling. • Optimize performance in Unity projects.	**CO3**
Experiment 9	**Augmented Reality Setup and Interaction** • Understand AR hardware and develop AR experiences. • Set up AR sessions and detect/tracking surfaces. • Place virtual objects in the real world and implement interactions.	**CO4**

Experiment 10	**Virtual Reality Development** • Develop VR experiences using Unity. – • Configure Unity for Oculus development. – • Develop a VR experience for the Meta Quest platform. - Implement VR interactions like grabbing and teleportation.	**CO4**
List of Submission:		
Minimum No. of Experiments: 10		

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	PSO1	PSO2
CO 1	2	3	1	3	2	3	-	-	1	2	3	3	2	2
CO 2	1	1	3	2	2	1	-	-	3	3	1	1	-	-
CO 3	1	3	1	3	1	3	1	3	1	1	3	3	1	1
CO 4	1	1	3	1	3	3	2	1	3	3	1	1	1	-

1: Slight(Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
Audit Course Lab I : CE2744 : ABAP Programming for SAP HANA Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	4Hrs/week		**ISE**	-
Total Credits	Audit Course		**ESE**	-

Prerequisite : Java Programming

Course Outcomes (CO): Students will be able to

CO1	Understand SAP HANA concepts, key technologies, and use of SAP HANA Studio and ADT
CO2	Identify and address ABAP code performance issues and understand SAP HANA's technical requirements and deployment options
CO3	Utilize Enhanced Open SQL, Core Data Services (CDS), and develop with SAP HANA Native SQL and ABAP Managed Database Procedures
CO4	Integrate SAP HANA models into ABAP, transport objects, and optimize reports with Full Text Search.

Course Contents		CO
Experiment 1	Introduction:-SAP HANA Basics and Technical Concepts, SAP HANA Studio, ABAP and SAP HANA	**CO1**
Experiment 2	Introducing the ABAP Development Tools (ADT), • Taking ABAP to SAP HANA, • SAP HANA as Secondary Database– Access via Open SQL.	**CO1**
Experiment 3	Code Checks to Prepare ABAP Code for SAP HANA, • Tools to Analyse Potential Performance Issues, • Guided Performance Analysis.	**CO2**
Experiment 4	SQL Performance Rules for SAP HANA, • Database Independent Code-to-Data • Classical Open SQL and Its Limitations.	**CO2**
Experiment 5	Enhanced Open SQL, • The Basics of Core Data Services in ABAP, • Associations in Core Data Services, • Outlook: More Interesting Features of CDS.	**CO3**
Experiment 6	SAP HANA specific Code-to-Data, • The Syntax of SAP HANA Native SQL, • ABAP Managed Database Procedures, • ABAP Managed Database Procedures.	**CO3**
Experiment 7	Use of SAP HANA Information Models in ABAP, • Advanced Topics, • Transporting SAP HANA Objects with ABAP Transport Requests.	**CO4**
Experiment 8	Using SAP HANA Full Text Search, • ABAP List Viewer with Integrated Database Access (ALV IDA), • Case Study: Optimize a Report on Flight Customer Revenue	**CO4**
Experiment 9	Describing SAP HANA, • Understanding the Need for a Modern Digital Platform, • Describing How SAP HANA Powers a Digital Platform,	**CO1**
Experiment 10	Key Technologies of SAP HANA, • Deploying SAP HANA, • Identifying the Key Roles in an SAP HANA Implementation.	**CO1**
Experiment 11	Technical Requirements of SAP HANA, Technical Deployment Options	**CO2**
Experiment 12	High Availability and Disaster tolerance, SAP HANA Lifecycle Management Tools	**CO2**

List of Submission:

Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	-	-	-	1	-	-	-	1	2	-	1	2	1
CO 2	3	2	-	3	3	-	-	-	3	3	-	1	1	2
CO 3	3	3	3	3	3	1	-	1	2	3	-	1	-	1
CO 4	3	3	3	3	3	1	-	1	3	3	2	1	2	-

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
Audit Course Lab I: CE2754: EV design and 3D Modellinglab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		**ISE**	--
Total Credits	Audit Course		**ESE**	--

Course Outcomes (CO): Students will be able to

CO1	Demonstrate various softwares needed for 3D modelling
CO2	Design 3D model of EV components
CO3	Design of EV Assembly and integration
CO4	Create Visualization renders of EV

Course Contents		CO
Experiment 1	Explore 3D modeling softwares	**CO1**
Experiment 2	Introduction Solidwork software	**CO1**
Experiment 3	3D modeling of EV components	**CO2**
Experiment 4	Drafting of EV components in solidworks	**CO2**
Experiment 5	Basic sketching techniques need for EV components	**CO2**
Experiment 6	EV layout design	**CO3**
Experiment 7	Structure design of EV in solidworks	**CO2**
Experiment 8	parts design of EV component	**CO2**
Experiment 9	Surface modeling of EV components	**CO2**
Experiment 10	Assembly sequencing of EV components.	**CO3**
Experiment 11	Vehicle integration of EV parts	**CO3**
Experiment 12	Visualization techniques for 3D data	**CO4**
List of Submission:		
Minimum No. of Experiments: 10		

Mapping of COs and POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	1	2	3	1	2	1	2	1	1	2	-	1
CO 2	3	2	1	3	3	2	2	1	1	1	1	2	1	2
CO 3	2	3	3	1	3	1	3	2	2	2	2	3	-	1
CO 4	3	3	3	3	3	1	3	1	2	2	2	3	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
Audit Course Lab I: CE2764: Foundation of Electrical Vehicle Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-

Prerequisite : Mathematics, Basic Programming skills

Course Outcomes (CO): Students will be able to

CO1	Perform experiments by interfacing sensor with microcontroller
CO2	Illustrate the MATLAB programming for EV systems
CO3	Develop and execute the Simulink model for different EV units
CO4	Design the power supply EV unit on PCB.

Course Contents		CO
Implementation of following concepts		
Experiment 1	Introduction to booting process of raspberry pi	**CO1**
Experiment 2	Perform experiment to control the speed of dc motor	**CO1**
Experiment 3	Interface IR/ PIR sensor with microcontroller	**CO1**
Experiment 4	Interface ultrasonic sensor with microcontroller and find distance	**CO1**
Experiment 5	Developing SIMULINK Models for Vehicle Units	**CO3**
Experiment 6	Programming EV Systems in MATLAB	**CO2**
Experiment 7	Application of Data Analysis Techniques in EV Electrical system	**CO2**
Experiment 8	Design a power supply unit and create a PCB design for same.	**CO4**
Experiment 9	Modelling and simulation of EV powertrain components in MATLAB	**CO3**
Experiment 10	Analysis of EV powertrain components in ANSYS	**CO3**
Experiment 11	Battery Management System modelling	**CO3**
Experiment 12	Modelling of Li-ion battery pack using MATLAB and ANSYS	**CO3**
List of Submission:		
Minimum No. of Experiments: 10		

Mapping of COs and POs

PO →	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1	2	3	1	3	-	1	-	2	-	2	2	-	1
CO 2	1	2	3	2	3	-	1	-	2	-	2	2	1	2
CO 3	1	2	3	3	3	-	1	-	2	-	2	2	-	1
CO 4	1	2	3	3	3	-	1	-	2	-	2	2	2	-

1: Slight(Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Civil Engineering				
Audit Course Lab I: CE2774: Fundamentals of Image Processing Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
Prerequisite :				
Course Outcomes (CO): Students will be able to				
CO1	Understand fundamentals of Image Processing Operations			
CO2	Apply and analyse rendering and visualisation of 2D and 3D images			
CO3	Analysis of various transforms & signals			
CO4	Design and Evaluation of Various Classification, detection and segmentation techniques			

Course Contents		CO
Implementation of following concepts		
Experiment 1	Sampling and Quantization operation using Image processing.	**CO1**
Experiment 2	Data Augmentation techniques for Computer vision	**CO1**
Experiment 3	Histogram Analysis for Various medical analysis	**CO1**
Experiment 4	Apply volume rendering and volume visualizing approaches on 2D/3D Images	**CO2**
Experiment 5	Visualize and explore 2D images and 3D volumes.	**CO2**
Experiment 6	Implement multi-resolution techniques on large-scale high-resolution images	**CO2**
Experiment 7	EEG brain signal analysis using wavelet transform	**CO3**
Experiment 8	ECG heart signal enhancement	**CO3**
Experiment 9	Brain Tumor detection and classification	**CO3**
Experiment 10	Fast Bilateral Filter – To eliminate the noise and smoothen the medical image	**CO4**
Experiment 11	CLAHE – To improve the contrast of the medical image	**CO4**
Experiment 12	Convolutional Neural Network (CNN) – To segment the tumor part	**CO4**
List of Submission:		
Minimum No. of Experiments:10		

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	PSO1	PSO2
CO 1	1	2	3	1	3	-	1	-	2	-	2	2	2	1
CO 2	1	2	3	2	3	-	1	-	2	-	2	2	1	2
CO 3	1	2	3	3	3	-	1	-	2	-	2	2	-	1
CO 4	1	2	3	3	3	-	1	-	2	-	2	2	1	1

1: Slight(Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

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Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Civil Engineering				
Audit Course Lab II: CE2819: Advanced AI Techniques and Applications Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-

Prerequisite : Mathematics, Basic Programming skills

Course Outcomes (CO): Students will be able to

CO1	Apply advanced techniques in NLP and Computer Vision to analyse and process diverse data types.
CO2	Develop AI solutions for solving complex decision-making problems in dynamic environment.
CO3	Implement industry-specific AI solutions ensuring ethical considerations and regulatory standards.
CO4	Utilize advanced ML techniques for time series forecasting and interpretability of AI models through explainable AI methods.

	Course Contents	CO
Implementation of following concepts		
Experiment 1	**Advanced NLP Experiment** • Build and evaluate a text classification model using advanced NLP techniques. • Utilize transformers and pre-trained models from Hugging Face.	**CO1**
Experiment 2	**Image Classification with CNNs** • Design and train a convolutional neural network (CNN) for image classification. • Experiment with data augmentation techniques to improve model performance.	**CO1**
Experiment 3	**Object Detection and Segmentation** • Implement object detection algorithms (e.g., YOLO, Faster R-CNN). • Perform image segmentation using models like U-Net or Mask R-CNN.	**CO1**
Experiment 4	**Reinforcement Learning Experiment** • Develop and train a reinforcement learning agent using OpenAI Gym. • Experiment with different RL algorithms like Q-learning or policy gradients.	**CO2**
Experiment 5	**Business Process Automation (BPA)** • Automate a business process using robotic process automation (RPA) tools. • Integrate machine learning models for intelligent decision-making in workflows.	**CO2**
Experiment 6	**Industry-Specific AI Solutions** • Develop a predictive maintenance model for manufacturing. • Implement a fraud detection system for financial transactions.	**CO3**
Experiment 7	**Cutting-Edge AI Research Experiment** • Conduct an experiment in a cutting-edge AI research area (e.g., GANs, BERT). • Analyze and document the research findings and their implications.	**CO3**
Experiment 8	**Scalable Machine Learning on Cloud Platforms** • Implement a distributed machine learning training pipeline on a cloud platform. • Utilize containerization and orchestration tools like Docker and Kubernetes.	**CO2**
Experiment 9	**Advanced Model Deployment and Monitoring** • Deploy a machine learning model in a production environment. • Set up monitoring tools to track model performance and detect anomalies.	**CO2**
Experiment 10	**Ethics and Fairness in AI Applications** • Evaluate an AI application for ethical considerations and fairness. • Propose and implement measures to address identified ethical concerns.	**CO3**
Experiment 11	**Time Series Forecasting with Deep Learning** • Develop a deep learning model for time series forecasting (e.g., using LSTM or GRU). • Compare the performance with traditional time series models.	**CO4**
Experiment 12	**Explainable AI (XAI)** • Implement explainability techniques (e.g., SHAP, LIME) for a complex model. • Analyze and interpret the model's predictions to ensure transparency and trustworthiness.	**CO4**

List of Submission:	
Minimum No. of Experiments: 10	

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	PSO1	PSO2
CO 1	2	3	3	3	3	1	-	-	-	-	-	2	2	1
CO 2	2	2	2	2	3	2	-	-	2	2	2	2	1	2
CO 3	3	3	3	3	3	-	1	2	1	2	3	2	-	2
CO 4	2	3	2	3	3	2	2	2	2	2	1	2	1	1

1: Slight(Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

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- Communication and presentation skills.
- Collaboration and peer review contributions.

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Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Civil Engineering				
Audit Course Lab II: CE2829: Advance AI and IoT Integration Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
Prerequisite : Mathematics, Basic Programming skills				
Course Outcomes (CO): Students will be able to				
CO1	Understanding AIoT Foundations.			
CO2	Apply Hands-on Implementation Skills.			
CO3	Analysis of Sensor Technologies.			
CO4	Design and deploy Innovative Solution.			

Course Contents		CO
Implementation of following concepts		
Experiment 1	Explore various AI applications across industries.	**CO1**
Experiment 2	Study the significance of IoT in the modern interconnected world.	**CO1**
Experiment 3	Understand the concept of AIoT and its potential impact.	**CO1**
Experiment 4	Explore the role of IoT gateways in bridging mobile devices and IoT networks.	**CO1**
Experiment 5	Perform hands-on exercises for setting up and configuring mobile-to-IoT connections.	**CO1**
Experiment 6	Conduct a comprehensive overview of sensor technologies used in IoT.	**CO3**
Experiment 7	Perform an in-depth exploration of various types of sensors and their academic underpinnings.	**CO3**
Experiment 8	Engage in practical demonstrations and experiments showcasing sensor functionality and applications in IoT systems.	**CO3**
Experiment 9	Develop a smart traffic signal system for colorblind individuals using AIoT technologies.	**CO2**
Experiment 10	Implement an AIoT-based plant health analysis system.	**CO2**
Experiment 11	Create a smart door access control system using AIoT technologies.	**CO2**
Experiment 12	Design and implement a weather forecasting system using AIoT technologies.	**CO2**
Experiment 13	Integrate real-time weather data from sensors with AI algorithms for accurate predictions.	**CO2**
Experiment 14	Engage in hands-on exercises for building, testing, and refining weather forecasting systems.	**CO2**
Experiment 15	Develop and deploy smart solutions utilizing AIoT principles.	**CO2**
Experiment 16	Study case studies and real-world examples of successful smart solutions in various domains.	**CO4**
Experiment 17	Participate in project-based learning to conceptualize, design, and implement AIoT solutions.	**CO4**
List of Submission:		
Minimum No. of Experiments: 14		

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	PSO1	PSO2
CO 1	3	3	2	2	2	-	-	-	-	2	-	2	2	1
CO 2	3	2	2	2	2	1	-	-	3	2	1	2	1	2
CO 3	2	2	3	2	2	-	1	1	3	2	-	2	1	1
CO 4	2	2	2	3	2	1	1	1	2	2	2	2	2	-

1: Slight(Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation

for the course completion

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

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Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Civil Engineering				
Audit Course Lab II: CE2839:Advanced ARVR Techniques and Applications Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-

Prerequisite : Mathematics, Basic Programming skills

Course Outcomes (CO): Students will be able to

CO1	Analyse the Evolution and Applications of Virtual Production Technique
CO2	Apply Proficiency in Unity Game Engine for Virtual Production
CO3	Evaluate Lighting Techniques and Design Principles for Virtual Environment
CO4	Demonstrate Practical Implementation Skills in Virtual Production Projects

Course Contents		CO
Implementation of following concepts		
Experiment 1	**Historical Overview and Evolution of Virtual Production** • Research and present a historical overview of virtual production techniques. • Analyze the evolution of virtual production in film, television, and other media industries. • Discuss the applications and benefits of virtual production in modern media production.	**CO1**
Experiment 2	**Green Screen Studio Setup and Operation** • Explore green screen studios and their setup. • Learn lighting techniques for green screen setups. • Operate a green screen studio to capture footage for virtual production.	**CO3**
Experiment 3	**Introduction to Unity Game Engine** • Overview of Unity Game Engine and its features. • Import assets into Unity for virtual production purposes. • Set up virtual environments within Unity for production purposes.	**CO2**
Experiment 4	**Real-time Rendering Techniques** • Understand real-time rendering and its importance in virtual production. • Explore techniques for achieving realistic visuals in real-time environments. • Utilize Unity's rendering capabilities for high-quality visual output.	**CO4**
Experiment 5	**Virtual Set Design Principles** • Study virtual set design principles and layout. • Design immersive virtual environments for different production needs. • Incorporate props, set dressing, and lighting to enhance realism and aesthetics.	**CO3**
Experiment 6	**Overview of Virtual Camera Systems** • Learn about different types of virtual cameras and their functionalities. • Understand the importance of virtual cameras in scene composition and framing. • Explore virtual camera operation within Unity for virtual production.	**CO3**
Experiment 7	**Lighting Techniques for Virtual Production** • Study different lighting setups and their effects on virtual production. • Experiment with various lighting techniques in a virtual environment. • Apply appropriate lighting to enhance the realism and aesthetics of virtual scenes.	**CO1**
Experiment 8	**Asset Importing and Management in Unity** • Learn best practices for asset importation into Unity. • Organize assets within Unity's project structure. • Understand asset optimization techniques for efficient usage in virtual production.	**CO2**
Experiment 9	**Creating Virtual Environments in Unity** • Utilize Unity's terrain and environment tools to build virtual landscapes. • Populate virtual environments with assets and objects.	**CO2**

	• Apply textures, materials, and effects to enhance the realism of virtual environments.	
Experiment 10	**Practical Application of Virtual Production Techniques** • Plan and execute a virtual production project using green screen studios and Unity. • Incorporate elements of virtual set design, lighting, and camera composition. • Produce a final virtual production project demonstrating mastery of virtual production techniques.	**CO4**
List of Submission:		
Minimum No. of Experiments:10		

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	PSO1	PSO2
CO 1	2	2	2	2	2	1	-	-	2	1	1	1	-	1
CO 2	3	2	1	2	2	1	-	-	2	1	1	1	1	2
CO 3	2	2	2	2	2	1	-	-	2	1	1	2	-	1
CO 4	2	2	2	3	2	1	-	-	2	1	2	2	2	-

1: Slight(Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
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Government College of Engineering, Karad					
Final Year (Sem – VIII) B. Tech. Civil Engineering					
Audit Course Lab II : CE2849: ABAP programming in Eclipse LAB					
Laboratory Scheme:			**Examination Scheme:**		
Practical	4 Hrs/week		**ISE**	-	
Total Credits	Audit Course		**ESE**	-	

Prerequisite : Java Programming

Course Outcomes (CO): Students will be able to

CO1	Explain the role and functionality of Eclipse in SAP development, including installation and navigation
CO2	Develop ABAP projects by creating, editing, and debugging repository objects using Eclipse
CO3	Assess ABAP code performance and quality using static testing tools, ABAP Unit Tests, and the ABAP Profiler within Eclipse
CO4	Design and implement advanced SAP applications, including Web Dynpro components and ABAP Dictionary Objects, utilizing Eclipse's development environment

Course Contents		CO
Experiment 1	Introduction to Eclipse, Understanding How SAP Uses Eclipse, Installing Eclipse	**CO 1**
Experiment 2	Defining an ABAP Project, Organizing Work with the Eclipse Workbench, The ABAP Development Cycle in Eclipse.	**CO 2**
Experiment 3	Creating Repository Objects, Editing a Repository Object, Debugging ABAP in Eclipse.	**CO 2**
Experiment 4	Function Groups and Function Modules.	**CO 2**
Experiment 5	ABAP Dictionary Objects in Eclipse, Working With Data Element, Working With Structures, Modelling Views with ABAP Core Data Services	**CO 4**
Experiment 6	ABAP Objects and Eclipse, Creating a Global Class, Refactoring	**CO 4**
Experiment 7	Web Dynpro Development, Creating Web Dynpro Components	**CO 4**
Experiment 8	Navigating in Eclipse, Searching in Eclipse	**CO 1**
Experiment 9	Managing Version Control, Identifying Sources of Help and Information	**CO 1**
Experiment 10	Testing and Analysis, Performing Static Testing with the Syntax Check, Performing Static Testing with the ABAP Test Cockpit.	**CO 3**
Experiment 11	Performing ABAP Unit Tests, Analysing Performance with the ABAP Profiler.	**CO 3**
Experiment 12	Eclipse: An Extensible Toolkit, Lesson: Extending Eclipse Functionality with Other SAP Tools.	**CO 1**

List of Submission:

Minimum No. of Experiments : 10

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	PSO1	PSO2
CO1	3	2	-	-	2	-	-	-	2	2	-	1	3	1
CO2	3	1	3	2	2	-	-	-	2	2	-	1	2	-
CO3	3	3	3	3	2	-	-	1	3	3	-	1	1	-
CO4	3	2	3	3	3	1	1	1	3	3	1	1	1	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for
the course completion

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

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- Communication and presentation skills.
- Collaboration and peer review contributions.

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Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Civil Engineering				
Audit Course Lab II: CE2859: EV Design Analysis and simulation Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		**ISE**	--
Total Credits	Audit Course		**ESE**	--
Prerequisite : Basic Electrical Engineering				
Course Outcomes (CO): Students will be able to				
CO1	Demonstrate various softwares needed for analysis and simulation			
CO2	Design 3D mesh of EV components			
CO3	Analysis 3D data with different simulation softwares			
CO4	Thermal analysis of battery components			

Course Contents		CO
Experiment 1	Introduction to ANSYS	**CO1**
Experiment 2	Mesh model development using Hyper mesh- 2D	**CO1**
Experiment 3	Mesh model development using Hyper mesh- 3D	**CO2**
Experiment 4	Modelling and simulation of EV powertrain components in MATLAB	**CO2**
Experiment 5	3D modelling of EV powertrain components in ANSYS	**CO3**
Experiment 6	Simulation of EV powertrain components in ANSYS	**CO2**
Experiment 7	EV design and structural analysis:	**CO2**
Experiment 8	FEA analysis for EV engineering with Abaqus	**CO2**
Experiment 9	Analyze EV dynamic and simulation:	**CO1**
Experiment 10	CFD analysis for EV	**CO3**
Experiment 11	Thermal Analysis of Liquid-Cooled Radiator in ANSYS	**CO3**
Experiment 12	CFD Study of External Cooling Mechanism	**CO4**
List of Submission:		
Minimum No. of Experiments: 10		

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	PSO1	PSO2
CO1	2	2	1	2	2	1	2	1	2	1	1	2	2	2
CO2	3	2	1	3	2	2	2	1	1	1	1	2	-	1
CO3	2	3	3	3	3	1	3	2	2	2	2	3	-	-
CO4	3	3	3	3	3	1	3	1	2	2	2	3	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for
the course completion

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

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- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

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Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Civil Engineering				
Audit Course Lab II: CE2869:: Advanced Electrical Vehicle Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
Prerequisite : Mathematics, Basic Programming skills				
Course Outcomes (CO): Students will be able to				
CO1	Understand basics of Various convertors & VSI grid integration			
CO2	Analyze Battery controller, cell balancing and SoC control			
CO3	Evaluate speed control operations using Modelling& Simulation			
CO4	Design and Simulate Electric Vehicle and Battery modding			

Course Contents		**CO**
Implementation of following concepts		
Experiment 1	Simulation of SPWM technique for electric vehicle converter using MATLAB/Simulation.	**CO1**
Experiment 2	Simulation of three phase VSI for grid integration in EV using MATLAB/Simulation..	**CO1**
Experiment 3	Design of bidirectional battery circuit using Buck/Boost converter using MATLAB/simulation.	**CO1**
Experiment 4	Battery controller based on SoC for charging and discharging of battery in EV using MATLAB Simulation.	**CO2**
Experiment 5	Modelling and Simulation of BMS for passive cell balancing in EV using MATLAB Simulation.	**CO2**
Experiment 6	SoC control of Lithium Ion battery in MATLAB/ Simulink for EV	**CO2**
Experiment 7	Simulation of bidirectional operation in Electric Vehicle Charger using single phase model.	**Co3**
Experiment 8	Modelling and simulation to calculate electric vehicle speed from motor torque.	**CO3**
Experiment 9	Speed control of electric vehicle using BLDC or PMSM in MATLAB/Simulink.	**Co4**
Experiment 10	Simulation of electric vehicle using MATLAB/Simulink.	**CO4**
List of Submission:		
Minimum No. of Experiments :10		

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	PSO1	PSO2
CO 1	1	2	3	1	3	-	1	-	2	-	2	2	2	2
CO 2	1	2	3	2	3	-	1	-	2	-	2	2	-	1
CO 3	1	2	3	3	3	-	1	-	2	-	2	2	-	-
CO 4	1	2	3	3	3	-	1	-	2	-	2	2	1	2

1: Slight(Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for
the course completion

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

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Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Civil Engineering				
Audit Course Lab II: CE2879: Advanced Image Processing Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
Prerequisite : Image Processing				
Course Outcomes (CO): Students will be able to				
CO1	Apply Support Vector Machine for image classification.			
CO2	Articulate image enhancement and restoration techniques			
CO3	Examining image compression Techniques			
CO4	Implementing image segmentation Techniques and Object recognition.			

Course Contents		CO
Implementation of following concepts		
Experiment 1	Support Vector Machine (SVM) – To classify the cancer tumor	**CO1**
Experiment 2	Automated Segmentation and analysis of skeletal structure images and scans	**CO4**
Experiment 3	Classifying and locating morphological patterns in an automatic way (on CT and radiographs)	**CO1**
Experiment 4	Brain tumor and also tissue segmentation	**CO4**
Experiment 5	Age and also gender classification using Brain MRI	**CO2**
Experiment 6	Computer aided diagnosis using Mammography	**CO2**
Experiment 7	Lung cancer detection using medical image processing	**CO2**
Experiment 8	Kidney stone detection using medical image processing	**CO3**
Experiment 9	Study of color image compressing using image processing	**CO3**
Experiment 10	Skin cancer detection	**CO4**
List of Submission:		
Minimum No. of Experiments:10		

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	PSO1	PSO2
CO 1	1	2	3	1	3	-	1	-	2	-	2	2	1	-
CO 2	1	2	3	2	3	-	1	-	2	-	2	2	-	1
CO 3	1	2	3	3	3	-	1	-	2	-	2	2	-	-
CO 4	1	2	3	3	3	-	1	-	2	-	2	2	2	1

1: Slight(Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

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