Government College of Engineering, Karad

Third Year (Sem – V) B. Tech. Civil Engineering

CE 2511 : (Open Elective-II) Instrumentation for Construction 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 the use of various transducers and sensors for measurement
2.	learn working of various 'storage & output' devices
3.	Understand the fundamentals of signal conditioning circuits
4.	Implement the instrumentation system for measurement of physical parameters

	Course Contents	Hours
Unit 1	**Measurement fundamentals -** Significance, units & standards, errors in measurement, Measuring system- overview of transducer & its environment, functional stages, sensing process.	**(04)**
Unit 2	**Transducers and Sensors -S**tudy of transducers- position and motion, strain, force, pressure and flow, temperature, sound. Digital transducers. Proximity devices, optical sensors, smart sensors	**(08)**
Unit 3	**Measuring devices** - CRO, digital storage oscilloscope, function generators, digital voltmeters(DVM), digital multimeters, signal generators, spectrum analyzer, logic analyzer, digital frequency meter, Q-meter, LED, LCD, Graphics Display.	**(08)**
Unit 4	**Signal conditioning & data acquisition -** Amplifiers, binary numbering system, theory of active filters, digital techniques, encoder- decoder, ADC and DAC, introduction to digital signal processing & its applications.	**(06)**
Unit 5	**Overview of dam instrumentation -**Purpose, instrument types & their uses, calibration & certification, instrumentation system planning & monitoring – seismic, seepage, leakage, stress & soil movement monitoring.	**(06)**
Unit 6	**Hydro – Meteorological instrumentation - M**easurement of rainfall, snowfall, humidity etc., Measurement of water level by - ultrasonic echo sounder, automatic water level recorder, RADAR gauge, Measurement of streamflow/velocity by- current meter, dilatation technique, electromagnetic method	**(04)**

Text Books

1.	A.K.Sawhney, "A course in Electrical, Electronics measurement and Instrumentation", Danpat Rai Publication, (2005 edition)
2.	Francis S Tse & Evan E Morse, "Measurement & Instrumentation in Engineering", CRC press, (1st edition)
3.	Patranabis D.," Sensor and Actuators", Prentice Hall of India (Pvt) Ltd., (2005 edition)
4.	Rangan, Mani and Sharma, "Instrumentation Devices and Systems", Tata McGraw Hill, New Delhi, (2nd edition)

Reference Books

1.	Central Water Commission, "Guidelines for instrumentation of large dams", (January 2018)
2.	Rohit Khurana, "Electronic Instrumentation and Measurement", Vikas Publication,(1st edition)
3.	Chen C.T., "Digital Signal Processing: Spectral Computation & Filter Design", Oxford Univ. Press, (2001 edition)

Useful Links

1.	NPTEL course ,dept of Mechanical engineering , "Mechatronics & Manufacturing Automation" by Dr. Shrikrishna Joshi , IIT Guwahati https://nptel.ac.in/courses/112/103/112103174/
2.	NPTEL course ,dept of Electrical engineering , "Industrial Instrumentation" by Prof. Alok barua, IIT Kharagpur https://nptel.ac.in/courses/108/105/108105064/

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

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	04	04	03	15
Understand	04	04	03	15
Apply	04	04	02	15
Analyse	03	03	02	15
Evaluate	00	00	00	00
Create	00	00	00	00
TOTAL	15	15	10	60

Government College of Engineering, Karad

Third Year (Sem – V) B. Tech. Civil Engineering

CE 2521: (Open Elective II) Soft Computing Tools

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

Course Outcomes (CO)

Students will be able to,

1.	understand the concept of soft computing.
2.	promote sustainable development through optimization.
3.	acknowledge the significance of artificial intelligence and its applications
4.	apply soft computing tool to solve problems in varieties of application domains.

	Course Contents	Hours
Unit 1	**Introduction** Introduction to soft computing, difference between hard and soft computing, requirement of soft computing, major areas of soft computing, list of software used for soft computing, applications of soft computing in civil engineering.	**(04)**
Unit 2	**Numerical Methods** Finding area by Simpson's rule, trapezoidal rule, finding root of an equation by- Newton-Raphson techniques and Bisection method, solution of simultaneous equations by- Gauss elimination method, Gauss Jordan method and iteration method. Application in engineering problems.	**(06)**
Unit 3	**Fuzzy Systems** Introduction to fuzzy logic, fuzzy sets and membership functions, operations on fuzzy sets. Fuzzy relations, rules, propositions, implications and inferences, defuzzification techniques, fuzzy logic controller design, some applications of fuzzy logic.	**(07)**
Unit 4	**Genetic Algorithm** History of genetic algorithms (GA), working principle, various encoding methods, fitness function, GA operators- reproduction, crossover, mutation, convergence of GA, bit wise operation in GA, multi-level optimization	**(07)**
Unit 5	**Neural Networks** Neural network, learning rules and various activation functions, single layer perceptrons, back propagation networks, architecture of backpropagation (BP) networks, backpropagation learning, variation of standard back propagation neural network, introduction to associative memory, recent applications in civil engineering.	**(07)**
Unit 6	**Applications in Civil Engineering** Application in- structural engineering, water resources engineering, environmental, geo-technical engineering, transportation engineering, construction automation.	**(05)**

Text Books

1.	S.Rajasekaran, G. A. Vijayalakshami, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications", PHI Learning; 2nd Revised edition (30 June 2017)
2.	Bhargava A.K., "Fuzzy Set Theory Fuzzy Logic and their Applications" S. Chand Publications (December 2013)
3.	Melanie Mitchell, "An Introduction To Genetic Algorithms", PHP publications.(January 2002)
4.	Rajesh Kumar Gupta, "Numerical Methods: Fundamentals and Applications" Cambridge University Press; First edition (May 2019)

Reference Books

1.	Simon S. Haykin, "Neural Networks", 2nd Edition, Goodreads publication(2009)
2.	David E. Goldberg, "Genetic Algorithms" , Perason publications.(December 2008)
3.	Chin Teng Lin, C. S. George Lee, "Neuro-Fuzzy Systems", PHI Prentice Hall PTR Publications.(1996)
4.	Paviz Moin, "Fundamentals of Engineering Numerical Analysis" Cambridge University Press; 2 edition (30 August 2010)
5.	J. S, Jang, C. T. Sun,E. Mizutani, "Neuro Fuzzy and Soft Computing" Pearson Education India; 1 edition (1 January 2015)

Useful Links

1.	https://www.digimat.in/nptel/courses/video/106105173/L01.html "Introduction to soft computing" by Debasis Samanta, IIT Kharagpur.
2.	https://www.digimat.in/nptel/courses/video/106105173/L02.html "Introduction to Fuzzy Logic" by Debasis Samanta, IIT Kharagpur.
3.	https://www.digimat.in/nptel/courses/video/106105173/L14.html

	"Concept of Genetic Algorithm" by Debasis Samanta, 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	1	-	1	-	1	1	-	-	-	-	1	-	-
CO 2	-	-	-	-	-	-	3	-	-	-	-	-	-	-
CO 3	3	1	-	1	1	-	-	-	-	-	-	-	-	-
CO 4	1	-	1	-	-	1	-	-	-	-	-	3	3	3

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	04	04	03	15
Understand	04	04	03	15
Apply	04	04	02	15
Analyse	03	03	02	15
Evaluate	00	00	00	00
Create	00	00	00	00
TOTAL	15	15	10	60

Government College of Engineering, Karad

Third Year (Sem – V) B. Tech. Civil Engineering

CE2531: (Open Elective II) Environmental Impact Assessment

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		**CT – 1**	15
Tutorials	0 Hrs/week		**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.	carry out scoping and screening of projects for environmental and social assessments.
2.	explain different methodologies for environmental impact prediction and assessment.
3.	prepare environmental impact assessment reports and environmental management plans.
4.	assess socioeconomic investigation of the environment in a project.

	Course Contents	Hours
Unit 1	**Introduction –** Impacts of development on environment, sustainable development and Environmental Impact Assessment (EIA), objectives, historical development, EIA types, EIA in project cycle, EIA notification and legal framework in India, selection & registration criteria for EIA consultants, stakeholders and their role in EIA.	**(06)**
Unit 2	**Environmental Pollution and Legislation –** Environmental pollution due to increasing growth rate, population and human interaction, water, land and air pollution, Environmental Protection acts, Rules and Standards, EIA guidelines.	**(05)**
Unit 3	**Environmental Assessment –** Screening and scoping in EIA, drafting of Terms of Reference (TORs), baseline monitoring, prediction and assessment of impacts on land, water, air, noise and energy, flora and fauna, matrices, networks, checklist methods, mathematical models for impact prediction, analysis of alternatives.	**(07)**
Unit 4	**Environmental Management Plan –** Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna, Environmental Monitoring Plan, EIA report preparation, review of EIA reports, Environmental Clearance, Post Project Audit.	**(07)**
Unit 5	**Socio-Economic Assessment –** Baseline monitoring of socio-economic environment, identification of project affected personal, rehabilitation and resettlement plan, economic valuation of environmental impacts, cost benefit analysis, public consultation.	**(06)**
Unit 6	**Case Studies –** EIA case studies pertaining to infrastructure projects, real estate development, roads and bridges, mass rapid transport systems, ports and harbour, airports, dams and irrigation projects, waste processing and disposal facilities, mining projects.	**(05)**

Text Books	
1.	Larry Canter, "Environmental Impact Assessment", 2nd Edition, McGraw Hill Inc., New Delhi.
2.	Bindu N. Lohani *et al.*, "Environmental Impact Assessment for Developing Countries in Asia - Volume 1, Overview", Asian Development Bank.
3.	Peter Morris and Riki Therivel," Methods of Environmental Impact Assessment", Routledge Publisher
Reference Books	
1.	Becker H. A. and Frank Vanclay,"The International handbook of social impact assessment: conceptual and methodological advances", Edward Elgar Publishing
2.	Barry Sadler and Mary McCabe,"Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme.
3.	Judith Petts, "Handbook of Environmental Impact Assessment Vol. I and II", Blackwell Science, New York.
4.	Ministry of Environment and Forests, "EIA Notification and Sectorial Guides", Government of India, New Delhi.
Useful Links	
1.	NPTEL Course – Environmental Science – **Environmental Management** – By Prof. T.V. Ramachandra, IISc Banglore – https://nptel.ac.in/courses/120/108/120108004/
2.	NPTEL Course – Multidisciplinary – **Ecology and Environment** – By Multi-Faculty, IIT Madras – https://nptel.ac.in/courses/127/106/127106004/#

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	0	0	0	0	2	2	3	2	0	2	0	1
CO 2	3	2	0	2	3	0	0	0	0	0	0	0	0	1
CO 3	3	0	3	3	2	2	0	0	2	2	3	2	3	3
CO 4	2	2	2	3	0	0	0	0	0	1	2	0	0	2

Assessment Pattern

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

Third Year (Semester – V) B. Tech. Civil Engineering

CE2502 : Design of steel structure

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/ Week		**CT – 1**	15
Total Credits	3		**CT – 2**	15
			TA	10
			ESE	60
			Duration of ESE	**03 Hours**

Course Outcomes (CO)

Student will be able to:

1.	understand laws and principles related to different design methodologies and philosophies.
2.	assess values of reactive parameters in steel structural members and connections under different loading conditions.
3	apply appropriate design methods to design different steel structural members and connections.
4.	predict behaviour of steel structural members and connection to make necessary inferences according to design.

	Course Contents	Hours
Unit 1	a) Introduction to design of steel structures, design philosophy, comparison of LSM & WSM, advantages and disadvantages of steel structures, types of steel structures, grades of structural steel, various rolled steel structures, loads and load combinations, partial safety factors for load and materials, load calculation for roof trusses. b) Types of bolts & welds, analysis and design of axially and eccentrically loaded bolted and welded connections (subjected to bending and torsion).	**06**
Unit 2	**Tension members:** Common sections, net area, modes of failure, load carrying capacity, design of axially loaded tension members, and design of end connections (bolted and welded).	**06**
Unit 3	**Compression members as struts:** Common sections, economical sections, effective length, slenderness ratio, modes of failure, classification of cross section, behaviour of compression member, load carrying capacity, design of compression members.	**06**
Unit 4	**a) Columns:** Design of columns subjected to axial and eccentric loading, design of lacing, battening system, column splices. **b) Column bases:** Design of slab bases & gusseted base subjected to axial and eccentric load and design of concrete pedestal.	**06**
Unit 5	Types of sections, behaviour of beam in flexure, design of laterally supported, unsupported beams and built up beam using flange plates, curtailment of flange plates, check for deflection, shear, web buckling and web crippling. Secondary and main beam arrangement, beam to beam connections.	**06**
Unit 6	**a) Gantry girder:** Forces acting on gantry girder, commonly used sections, design of gantry girder as laterally unsupported beam, connection details. **b) Plate girder:** Introduction to plate girder and design concept, design of plate girder: design of cross section, curtailment of flange plates, stiffeners and connections. **c) Lattice girder:** Introduction to lattice girder.	**06**

Text Books

1.	Subramanian N., "Design of Steel Structures - Limit State Method", Oxford University Press, New Delhi. 2015
2.	Duggal S. K., "Limit State Design of Steel Structures", McGraw Hill Education (India) Pvt Ltd. (3rd Edition). 2019.
3.	Shiyekar M. R., "Limit State Design in Structural Steel", PHI Publications. (3rd Edition). 2011.
4.	Sairam K. S., "Design of Steel Structures", Pearson Education India, (2nd Edition). 2013.

Reference Books

1.	IS: 800 – 2007, IS: 875 (Part I, II and III), SP 6 (1) & SP 6 (6), IS: 808-1989.
2.	Steel Construction Manual, AISC, (15th Edition). 2017.
3.	Shah V. L., Gore V., "Limit State Design of Steel Structures IS: 800 – 2007", Structures Publication, Pune. 2012.

Useful Links

1.	NPTEL Course – Civil Engineering – Design of Steel Structures I – Satish Kumar, IIT Madras – http://nptel.ac.in/courses/105106112/
2.	NPTEL Course – Civil Engineering – Design of Steel Structures II – Satish Kumar, IIT Madras – http://nptel.ac.in/courses/105106113/

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

Assessment Pattern (with revised Bloom's Taxonomy)

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

Government College of Engineering, Karad

Third Year (Semester – V) B. Tech. Civil Engineering

CE2503 : Foundation Engineering

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/ Week		**CT – 1**	15
Total Credits	3		**CT – 2**	15
			TA	10
			ESE	60
			Duration of ESE	**02 Hours 30 Minutes**

Course Outcomes (CO)

Student will be able to:

1.	interpret the importance of site exploration and investigation methods for civil engineering construction projects.
2.	summarise the concept of stability of slopes.
3.	evaluate the bearing capacity.
4.	analyse and design shallow and deep foundations.
5.	familiarize with the modern substratum techniques.

	Course Contents	Hours
Unit 1	**Soil exploration and geotechnical investigation:** Significance of site exploration, planning a sub-surface exploration program: general & detailed exploration, depth of exploration, number & spacing of pits and boring, location of water table, methods of site exploration, soil sampling and samplers, types of soil sample: disturbed & undisturbed samples, in – situ tests (SPT, DCPT, SCPT, pressure meter, field vane shear test), preparation of soil investigation report.	**05**
Unit 2	**Stability of slopes:** Slope failure – basis of analysis, modes of failure, stability of an infinite slope of cohesive and cohesion less soils, wedge failure, Culmann's method, Taylor's stability number, Bishop's method, Swedish circle method, concept of friction circle method, improving stability of slopes. **Introduction to Rockfill Structures:** General features, Site selection, Merits and demerits of rockfill structures, Rockfill embankments, Rockfill dams, Causes of failure.	**06**
Unit 3	**Bearing capacity of shallow foundations:** Definitions, Rankine's analysis, Prandtl's analysis, Terzaghi's bearing capacity theory, bearing capacity failures, I.S. code method (IS 6403: 2002), effect of various factors on bearing capacity (size & shape, depth, water table, eccentricity), bearing capacity evaluation from plate load test (IS 2911: 2010) and SPT (IS 8009: 1980), foundation settlements, methods of computing settlements, numerical on calculation of ultimate and net bearing capacity.	**07**
Unit 4	**Design of shallow foundations:** Types and their selection, Rankine's analysis for minimum depth of foundation, principle of design of footings, assumptions & limitations of rigid design analysis, geotechnical design (numerical) of isolated, combined, strap footing (rigid analysis), raft foundation (elastic analysis), floating foundations – concept.	**07**
Unit 5	**Pile foundations:** Necessity, classification, construction methods of concrete bored piles, driven cast in-situ piles, load carrying capacity based on static analysis for cohesive and cohesion less soils, pile capacity using in- situ penetration tests and pile load test as per (IS 2911: 2010) specifications, negative skin friction, dynamic methods and their limitations, ultimate capacity, settlement of pile groups in sand and clay (IS 2911: 2010) and critical depth method, tension piles.	**06**
Unit 6	**Foundations in difficult subsoil:** General considerations, foundations in expansive soil and collapsible soil, significance of soil reinforcement, techniques of ground improvement – stone columns, vibro-flotation, preloading technique, sand drains, prefabricated vertical drains.	**05**

Text Books

1.	Arora K. R., "Soil Mechanics and Foundation Engineering", Standard Publishers (7th Edition). 2019.
2.	Murthy V. N. S., "Soil Mechanics and Foundation Engineering", CBS Publishers & Distributors (1st Edition). 2018.
3.	Punmia B. C., "Soil Mechanics and Foundation Engineering", Laxmi Publications (17th Edition). 2018.
4.	Ranjan G. & Rao A. S., "Basic and Applied Soil Mechanics", New Age International Publishers (3rd Edition).

Reference Books

1.	Dass B. M., "Foundation Engineering", Cengage Learning (7th Edition). 2013.
2.	Murthy V.N.S., "Advanced Foundation Engineering", CBS Publishers & Distributors, (1st Edition). 2017.
3.	Nayak N. V., "Foundation Design Manual", Dhanpat Rai Publications, (7th Edition). 2018.
4.	Terzaghi K. & Peck Wiley R., "Soil Mechanics in Engineering Practice", Willey India Pvt. Ltd., (3rd Edition). 1996.
5.	Relevant Indian Standard Specifications and Codes

Useful Links	
1.	NPTEL Course – Civil Engineering – Foundation Engineering – Mahendra Singh, Priti Maheswari and N. K. Samadhiya, IIT Roorkee – https://nptel.ac.in/courses/105/107/105107120/
2.	NPTEL Course – Civil Engineering – Foundation Engineering – Koushik Deb, IIT Kharagpur – https://nptel.ac.in/courses/105/105/105105176/
3.	NPTEL Course – Civil Engineering – Geotechnical Engineering II Foundation Engineering – Dilip Kumar Baidya, IIT Kharagpur https://nptel.ac.in/courses/105/105/105105185/
4.	NPTEL Course – Civil Engineering – Advanced Geotechnical Engineering – B.V.S. Viswanadham, IIT Bombay https://nptel.ac.in/courses/105/101/105101001/

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	1	-	1	-	3	-	-	1	1
CO 2	3	3	3	3	1	-	2	-	-	1	-	1	-	1
CO 3	3	3	3	3	-	1	-	-	-	2	-	-	-	2
CO 4	3	3	3	3	3	1	1	-	2	2	-	2	2	2
CO 5	3	3	3	3	2	1	-	1	-	1	1	2	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

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

Government College of Engineering, Karad

Third Year (Sem – V) B. Tech. Civil Engineering

CE2504: Water Resources Engineering

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 principles of open channel flow and possess skill to realise problems in water resources engineering
2.	calculate and interpret different elements of hydrologic cycle
3.	understand the irrigation water management problems
4.	understand application of system concept to cover the socio-technical aspect in the field of water resources

	Course Contents	Hours
Unit 1	**Uniform flow in open channel:**Difference between pipe flow and open channel flow, Types of open channel, Types of flows in open channel, Geometric properties and Velocity distribution **Steady and uniform flow:** Chezy's and Manning's formula, Roughosity coefficient, Uniform flow computations, Hydraulically efficient sections (Rectangular, Circular, Triangular and Trapizoidal) **Depth energy relationship in open channel flow:** Specific energy, Specific force, Specific discharge	**(07)**
Unit 2	**Gradually varied flow(GVF):** Classification of channel slope,, Dynamic equation of GVF, Classification of GVF profiles and examples, Direct step method of computation of GVF profiles **Rapidly varied flow(RVF):**Definition, Examples, Hydraulic jump phenomenon, relation of conjugate depths, parameters, uses, types of Hydraulic jump, Hydraulic jump as energy dissipater **Model laws:** Principle of Similitude, Reynolds model law, Froude's model law, Euler's model law, Weber's model law and Mach's model law	**(07)**
Unit 3	**Hydrology:** Importance and scopeof hydrology, the hydrologic cycle, Weather and its precipitation potential **Precipitation:** Forms and types of precipitation, Methods of measurement, Factors affecting precipitation at location, Estimating missing data, Mass rainfall curves, Hyetograph, double mass analysis(Correcting precipitation data) Determination of average precipitation over the catchment	**(06)**
Unit 4	**Abstractions from precipitation:** Evaporation- Measurement and control of evaporation upon reservoirs, Factors affecting evaporation Evapotranspiration- Concept and measurement. Infiltration- Process of infiltration, Factors affecting infiltration, Infiltration indices, Effect of infiltration on runoff and ground water recharge.	**(06)**
Unit 5	**Runoff:**Concept and Factors affecting runoff, Catchment yield calculations, Soil Conservation Service-Curve number(SCS-CN) method of estimating runoff volume, Rainfall-runoff relationship. **Hydrograph:**Storm hydrograph, Base flow and Separation of base flow, direct runoff hydrograph, Unit hydrograph – theory, assumptions and limitations, Derivation and use of unit hydrograph, S-curve hydrograph.	**(07)**
Unit 6	**Introduction to irrigation:** Importance and necessity of irrigation, Types of irrigation, Different systems of irrigation. **Soil-water relationship:** Classes and availability of soil water, depth and frequency of irrigation, principal crops and crop seasons, cropping pattern and crop rotation, Command area. **Water requirement of crops:** Duty, delta, factors affecting duty, methods improving duty, consumptive use of water, estimation of Evapo-transpiration by Blaney-Criddle method and penman method, assessment and efficiency of irrigation water.	**(07)**

Text Books

1.	Bansal R. K. 'Fluid Mechanics and Hydraulic Machines' Laxmi Publications (9th Edition)
2.	Subramanya K. 'Engineering Hydrology', Tata McGraw Hill, New Delhi(3rd Edition)
3.	Raghunath H. M. 'Engineering Hydrology', New Age International Publishers (2nd Edition)
4.	Garg S. K.'Irrigation Engineering',Khanna Publishers, Delhi. (23rd Edition)

Reference Books

1.	Streeter and Wylie, 'Fluid Mechanics' McGraw-Hill International book Co; Auckland (6th Edition)
2.	Majumdar D. K. , 'Irrigation Water Management (Principles and Practices)' Prentice Hall of India(P),Ltd(2nd

	Edition)
3.	Asawa G. L. 'Irrigation Engineering' New Age International Publishers (2nd Edition)
4.	VenTe Chow, 'Applied Hydrology' Tata McGraw Hill, New Delhi(1st Edition)
5.	Dr. Murtaza Ali, 'Land Soil and Water Resources' Koros Press Ltd(1st Edition)
6.	P. Jaya Rami Reddy, 'Hydrology' Firewall Media (3rd Edition)
7.	Ojha C. S. P., Berndtsson R., and Bhunya P., 'Engineering Hydrology' Oxford (2nd Edition)
8.	Modi P. N.'Irrigation, Water Resources and Water power Engineering', Standard book house(20thEdition)
9.	Murthy J.V.S., ' Watershed Management in India', Wiley Eastern Publications,Delhi(2nd Editions)
Useful Links	
1.	NPTEL Course-Civil Engineering-IIT Kanpur-Water Resources Engineering by Prof. R. Srivastav- http://nptel.ac.in/courses/105/104/105104103/
2.	NPTEL Course-Civil Engineering-IIT Guwahati-Hydraulicsby A. K. Sarma- http://nptel.ac.in/courses/105/103/105103096/
3.	NPTEL Course-Civil Engineering-IIT Bombay-Watershed Managementby T. I. Eldho- http://nptel.ac.in/courses/105/101/105101010/

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	3	3	1	1	1	0	0	0	0	0	2	2
CO 2	3	3	3	3	3	2	1	0	0	0	0	0	2	2
CO 3	3	3	3	3	3	2	1	0	0	0	0	0	2	2
CO 4	0	1	1	1	1	3	1	1	1	1	1	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

Third Year (Semester – V) B. Tech. Civil Engineering

CE2505 : Transportation Engineering

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 Hours 30 Minutes**

Course Outcomes (CO)

Students will be able to:

1.	understand the planning aspects and significance of geometric design of highways and railways.
2.	apply the knowledge of traffic engineering in pavement design.
3.	suggest and adopt appropriate material and methodology of pavement construction.
4.	comprehend the various terminologies and basic knowledge of tunnel engineering.

	Course Contents	Hours
Unit 1	**Highway Engineering:** Highway planning - objectives, methodology and phasing, road classification, highway geometrics - alignment and factors governing it, geometric design, cross - section elements, sight distance - requirement, types, horizontal alignment - design speed, super - elevation, extra widening, transition curves and their significance, vertical alignment - gradient, vertical curves.	**07**
Unit 2	**Traffic Engineering**: Traffic characteristics, traffic studies - types and methods, control measures - signs, signals and pavement markings, signal design by Webster's method, types of intersections, capacity of roadway, and level of service.	**06**
Unit 3	**Highway Construction:** Highway materials - selection criterion, design of bituminous mixes, pavement types and their construction practices, highway maintenance - types of failures in flexible and rigid pavements with remedial procedures, highway drainage - need, types, recent trends, highway lighting - importance, factors affecting and design of lighting system.	**06**
Unit 4	**Pavement Design:** Components and their functions, factors affecting, IRC design methods of flexible and rigid pavement (IRC 37: 2012 and IRC 58: 2011).	**05**
Unit 5	**Railway Engineering:** Rail geometrics - permanent way and its requirements, formation, components of track & their requirements, coning of wheels, defects in rails and corrective measures, track alignment: requirements & factors controlling, rolling stock, geometric design, creep-causes and measures, points & crossing, signalling, interlocking, track maintenance, future trends in rail transport.	**07**
Unit 6	**Tunnel Engineering**: Classification of tunnels and tunnelling methods, tunnelling in hard rock and soft soils, tunnel lining, tunnel drainage, ventilation in tunnels, tunnel lighting, tunnel hazards, recent trends in tunnelling.	**05**

Text Books

1.	Justo C. E. G., Khanna S. K., Veeraragavan A., "Highway Engineering" , Nemchand & Bros (10th Edition). 2015.
2.	Kadiyali L. R. and Lal N. B., "Principles and Practices of Highway Engineering", Khanna Publishers (7th Edition). 2013.
3.	Kadiyali L. R., "Traffic Engineering and Transport Planning", Khanna Publishers, (9th Edition).
4.	Satish Chandra, Agarwal M. M., "Railway Engineering", Oxford University Press, (2nd Edition). 2013.
5.	Saxena S. C., "Tunnel Engineering", Dhanpat Rai & Sons. 2013.

Reference Books

1.	Kadiyali L. R., "Transportation Engineering", Khanna Publishers. 2016.
2.	Clifford F. Bonnett, "Practical Railway Engineering", Imperial College Press, (2nd Edition). 2005.
3.	Wright P. H. and Dixon K., "Highway Engineering", Wiley India Pvt. Ltd., (7th Edition). 2009.
4.	Chakroborty P. and Das A., "Principles of Transportation Engineering", PHI Learning Pvt. Ltd., (2nd Edition). 2017.
5.	Brockenbrough R. L. and Boedecker K. J., "Highway Engineering Handbook", McGraw Hill, (2nd Edition). 2003.
6.	Garber N. J. and Hoel L. A., "Traffic and Highway Engineering", Cengage Learning, (4th Edition). 2009.
7.	Rao G. V., "Principles of Transportation and Highway Engineering", Tata McGraw Hill. 2000.

Useful Links	
1.	NPTEL Course – Civil Engineering – Advance Transportation Engineering – Partha Chakraborty and A. Das, IIT Kanpur – https://nptel.ac.in/courses/105/104/105104098/
2.	NPTEL Course – Civil Engineering – Introduction to Transportation Engineering – Bhargab Maitra and K. Sudhakar Reddy, IIT Kharagpur – https://nptel.ac.in/courses/105/105/105105107/
3.	NPTEL Course – Civil Engineering – Railway Engineering – Rajat Rastogi, IIT Roorkee – https://nptel.ac.in/courses/105/107/105107123/
4.	NPTEL Course – Civil Engineering – Introduction to multi-modal transport – Arkopal Kishore Goswami, IIT Kharagpur – https://nptel.ac.in/courses/105/105/105105204/
5.	NPTEL Course – Civil Engineering – Characterization of Construction Materials – Manu Santhanam and Piyush Chaunsali , IIT Madras – https://nptel.ac.in/courses/105/106/105106200/
6.	NPTEL Course – Civil Engineering – Maintenance and Repairs of Concrete Structures – Radhakrishnan G. Pilla, IIT Madras – https://nptel.ac.in/courses/105/106/105106202/
7.	NPTEL Course – Civil Engineering – Mechanical Characterization of Bituminous Materials – Multi – Facuty, IIT Madras – https://nptel.ac.in/courses/105/106/105106203/
8.	NPTEL Course – Civil Engineering – Geo-informatics in Transportation Engineering – Ashish Verma , IISc, Banglore – https://nptel.ac.in/courses/105/108/105108073/
9.	NPTEL Course – Civil Engineering – Infrastructure planning and management – A. Veeraragavan and Ashwin Mahalingam, IIT Madras – https://nptel.ac.in/courses/105/106/105106115/

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

Assessment Pattern (with revised Bloom's Taxonomy)

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

Government College of Engineering, Karad

Third Year (Semester – V) B. Tech. Civil Engineering

CE2516 : (Elective I) Town Planning & Transportation Engineering

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/ Week		**CT – 1**	15
Total Credits	3		**CT – 2**	15
			TA	10
			ESE	60
			Duration of ESE	**02 Hours 30 Minutes**

Course Outcomes (CO)

Students will be able to:

1.	understand the basic concept of law, roles and responsibilities of various plan preparation and implementation authorities.
2.	understand the rationales and foundations of planning.
3.	learn various terminologies associated with airport, dock & harbour and bridge engineering.
4.	understand the planning philosophy and discern design methodology of airport and bridge engineering.

	Course Contents	Hours
Unit 1	**Principles of Town Planning**: Necessity, scope and principles of town planning, brief history, various definitions of town and country planning, goals and objectives of planning, components of planning, benefits of planning, components of sustainable urban and regional development, contribution of town planners in modern era such as Sir Patrick Geddes, Sir Ebenezer Howard, Clarence stein and Le Corbusier.	**06**
Unit 2	**Constituents of Town Planning:** Growth pattern of towns - natural and planned, elements of town, concept and need for regional planning, definition of planning regions, development control rules with respective to town planning, introduction to rural development**,** meaning, nature and scope of development, nature of rural society in India, hierarchy of settlements, social, economic and ecological constraints for rural development.	**06**
Unit 3	**Laws in Relation to Planning:** History of planning legislation in India, concept of law, source of law, significance of law and its relationship to urban planning, concept of arbitration, 73rd and 74th amendment to the constitution and its related impact on the planning process in the state, introduction to development plan and regional plan, introduction to MRTP Act 1966, the right to fair compensation and transparency in land acquisition, Rehabilitation and Resettlement Act, 2013.	**07**
Unit 4	**Airport Engineering**: Air traffic forecasting, aircraft characteristics, master planning, geometric design, airfield design, drainage, lighting, markings and signaling.	**06**
Unit 5	**Dock & Harbour Engineering**: Classification, littoral drift, tides, waves and winds marine structures - wharves, breakwaters, piers, sea walls, docks, quay walls, locks and moorings.	**05**
Unit 6	**Bridge Engineering:** Types, hydraulic calculation, site selection, loads on bridges, bearings - types and functions, construction stages, inspection, maintenance and rehabilitation of bridges.	**06**

Text Books

1.	Gandhi N. K. and Shah M. N., “Town and country planning”.
2.	Misra S. N., “Rural development planning: design and method”, Satwahan Publication, New Delhi.
3.	Rangwala, “Airport Engineering”, Charotar Publishing (17th Edition). 2018.
4.	Srinivasan R., “Harbour Dock and Tunnel Engineering”, Charotar Publishing (29th Edition). 2018.
5.	Gupta B. L. and Gupta Amit, “Road, Railway, Bridge and Tunnel Engineering”, Standard Publisher Distributors, (5th Edition). 2018.
6.	Bindra S. P., “Principles and Practices of Bridge Engineering”, Dhanpat Rai Publications. 2012.

Reference Books

1.	Ansari J.H and Mahavir Shri, “Reading Material on Planning techniques”, Institute of Town Planners, India.
2.	J. Glasson Taylor and Francis, “An Introduction to Regional Planning- Concept, Planning and Practice.”
3.	Hughes J. T. and Kozlowski J., “Threshold Analysis - An Economic Tool for Town and Regional Planning.”
4.	Field B. G. and Mac Gregor B. D., “Forecasting techniques for Urban Planning”, UCL Press London. 1992.
5.	Kadiyali L. R., “Transportation Engineering”, Khanna Book Publishing (1st Edition). 2016.
6.	Horoneff R., Sproul W., Young S., “Aiprort Planning and Design”, McGraw Hill (5th Edition). 2010.
7.	Richard de Neufville and Amedeo R. Odoni, “Airport System Planning, Design & Management”, McGraw Hill (2nd Edition). 2013.
8.	Ponnuswamy S., “Bridge Engineering” Tata McGraw Hill (3rd Edition). 2017.

Useful Links	
1.	NPTEL Course – Civil Engineering – Urban Transportation Planning – M. Parida, IIT Roorkee – http://nptel.ac.in/courses/105107067/
2.	NPTEL Course – Civil Engineering – Urban Transportation Planning – V. Thamizh Arasan ,IIT Madras – http://nptel.ac.in/courses/105106058/
3.	NPTEL Course – Civil Engineering – Transportation Engineering II – Rajat Rastogi, IIT Roorkee – https://nptel.ac.in/courses/105/107/105107123/
4.	NPTEL Course – Civil Engineering – Port and Harbour Structures – R. Sundaravadivelu, IIT Madras – https://nptel.ac.in/courses/114/106/114106025/
5.	NPTEL Course – Civil Engineering – Reinforced Concrete Road Bridges – Nirjhar Dhang, IIT Kharagpur – https://nptel.ac.in/courses/105/105/105105165/

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

Assessment Pattern (with revised Bloom's Taxonomy)

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

Government College of Engineering, Karad

Third Year (Semester – VI) B. Tech Civil Engineering

CE 2526 : (Elective I) Air Pollution Control

Teaching Scheme			Examination Scheme	
Lectures	3 Hours / Week		**CT – 1**	15
Total Credits	3		**CT – 2**	15
			TA	10
			ESE	60
			Duration of ESE	**02 Hrs 30 Min**

Course Outcomes (CO)

Students will be able to

1.	understand scientific and engineering principles for air pollution studies
2.	apply the principles in solving engineering problems associated with the design and operation of air pollution control equipment with due consideration to technical, environmental, health, safety and social considerations
3.	analyse air pollution issues for research and development, industry, and consultancy activities.

	Course Contents	Hours
Unit 1	**Introduction to Air pollution** - Air pollution control act, current scenario of air pollution at national and global scales, sources and types air pollutants, criteria air pollutants and their effects, ambient air quality standards.	**(04)**
Unit 2	**Meteorology and Air Pollution** - Structure and composition of atmosphere, wind circulation, wind rose diagram, lapse rates, stability of atmosphere, inversion and its types, plume behaviour, maximum mixing depth, cyclones and anticyclones, precipitation & its relation to removal of air pollutants.	**(06)**
Unit 3	**Dispersion of Air Pollutants** - Air quality dispersion models, Gaussian dispersion model for point sources and line sources, applications and limitations of Gaussian model, plume rise- causes and significance, formulas for estimation of plume rise, plume down wash, stability classes, box model , street canyon model, introduction to AERMOD and other softwares.	**(08)**
Unit 4	**Air Quality management** - Control of air pollution from stationary and mobile sources, measures for effective control of air pollution in India, alternative fuels, air quality index, National Air quality Monitoring Program, Legislative measures International treaties for control and mitigation of air pollution.	**(06)**
Unit 5	**Control of Particulate Matter** - Sources of SPM, terminal settling velocity, particulate removal mechanisms, study of working principle and design of particulate control equipment, settling chamber, cyclone separator, fabric filter, electrostatic precipitator, Wet collectors, removal efficiency- block flow and mixed flow.	**(07)**
Unit 6	**Control of Gaseous pollutants** - Sources and types of gaseous pollutants, mechanisms for removal, various techniques for control of gaseous pollutants - principles suitability of absorption and adsorption, combustion/ incineration of gaseous pollutants, use of after burners, catalytic combustion, types and principle of condensation.	**(05)**

Text Books

1.	K. Wark, C. F. Warner & W. T. Davis, “Air Pollution Control: its Origin and Control”, Addision-Wesley.
2.	Stern A. C., “Air Pollution - Volume I and II”, Academic Press Inc Publication.
3.	Nevers N., “Air Pollution Control Engineering” McGraw - Hill, New York.

Reference Books

1.	Martin Crawford, “Air Pollution and Control”, Tata McGraw Hill Publication.
2.	Anjaneyulu Yerramilli, “Air Pollution Prevention and Control Technologies”, BS Publication.
3.	Rao C. S., “Environmental Pollution Control Engineering”, Wiley Eastern Ltd.
4.	W. L. Heumann, “Industrial Air Pollution Control Systems”, McGraw-Hill, New York.
5.	Peavy S. W., Rowe D. R. and Tchobanoglous G., “Environmental Engineering”, McGraw Hill, New Delhi.
6.	Garg S. K., “Environmental Engineering - Volume II”, Khanna Publishers, New Delhi.
7.	Richard W. Boubel, D. L. Fox, D. B. Turner & A. C. Stern, “Fundamentals of Air Pollution”, Reed Elsevier India Pvt. Ltd., New Delhi.

Useful Links	
1.	NPTEL Course – Civil Engineering – Environmental Air Pollution – Prof. Mukesh Khare – IIT Delhi – https://nptel.ac.in/courses/105/102/105102089/
2.	NPTEL Course – Civil Engineering – Environmental Air Pollution - Prof. Mukesh Sharma – IIT Kanpur – https://nptel.ac.in/courses/105/104/105104099/
3.	NPTEL Course – Chemical Engineering – Environmental Quality Monitoring & Analysis – Dr. R. Ravi Krishna – IIT Madras – https://nptel.ac.in/courses/103/106/103106162/
4.	NPTEL Course – Fundamentals of Environmental Pollution and Control – Mining Engineering – Prof. J. Bhattacharyya – IIT Kharagpur – https://nptel.ac.in/courses/123/105/123105001/

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	0	1	0	1	3	1	0	0	0	1	2	2
CO 2	2	2	2	2	2	3	3	2	0	0	0	1	3	2
CO 3	3	3	3	2	2	3	3	3	0	0	0	2	3	3

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

Second Year (Sem –V) B. Tech. Civil Engineering

CE2536 (Elective I) : Advanced Surveying

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

Course Outcomes (CO)

The Student will be able to

1.	Adopt the principles of advanced surveying instruments.
2.	Formulate Surveying problems.
3.	Knowledge of modern Surveying Techniques.
4.	Design and setout curves by different methods.

	Course Contents	Hours
Unit 1	**Measurement of distances and elevations** Measurement of distances and elevations. Tachometry –principles, suitability, methods. Stadia diaphragm, Stadia formulae. Tachometric contouring Electronic distance measurements –principle, construction and use of Geodimeter,Tellurometer, Distomat and Total station.	**(06)**
Unit 2	**Geodetic Surveying** Triangulation Principle and Classification, system, Selection of station, Base line. Measurement, correction and use of sub tense bar, Signals, satellite station, reduction to center, spherical excess, angular observations, Trilateration.	**(07)**
Unit 3	**Field Astronomy** Definition of Astronomical terms, Field Astronomy. Terms, co-ordinate systems, Spherical Trigonometry and spherical triangle. Properties of spherical triangle and formulae in Spherical Trigonometry. True bearing by observation on the sun and pole star.	**(06)**
Unit 4	**Curves** a) Significance of curves and curve setting b) Type of horizontal curve, elements of simple, compound, transition and combined curve, setting out of simple curve by linear and angular methods. c) Vertical curves – types, lengths of vertical curves measurements.	**(06)**
Unit 5	**Modern Surveying** Remote sensing – Definition, relevance, types, electromagnetic radiation and spectrum, , idealized systems, sensors, platforms, energy sources and its characteristics, image acquisition and image interpretation, applications to civil engineering	**(06)**
Unit 6	**GPS and GIS** GPS – Basic principles, GPS segments, receivers, applications in survey GIS – Terminology, advantages, basic components of GIS, data types, GIS analysis, applications of GIS software. RADAR/LIDAR surveying.	**(05)**

Text Books

1.	Surveying and Levelling Vol. I and II - T.P Kanetkar and S.V. Kulkarni, Pune Vidhyarthi Griha Prakashan. (Edition 2008)
2.	Surveying Vol., I, II and III - Dr. B.C. Punmia, Laxmi Publishers, New Delhi. (Edition 2005)
3.	Surveying Vol., I and II - S. K. Duggal, Tata McGraw Hill, New Delhi. (Edition 2007)

Reference Books

1.	Surveying and Levelling - R. Agor, Khanna Publishers, New Delhi (Edition 2000)
2.	Surveying and Levelling - N.N. Basak, Tata Mcgraw Hill, New Delhi. (Edition 2014)
3.	Surveying Vol., I, II and III - Dr. K.R. Arora, Standard Book House, New Delhi. (Edition 2001)
4.	Plane surveying – David Clark. (Edition 2001)
5.	

Useful Links

1.	http://www.nptel.iitk.ac.in/BharatLohani
2.	www.ocw.mit.edu
3.	http://www.nptel.iitr.ac.in/S.K.Ghosh

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	0	0	1	0	0	0	3	0	0	1		
CO 2	2	2	2	1	3	0	0	0	3	1	1	1		
CO 3	2	2	2	1	3	0	0	0	3	2	1	0		
CO 4	1	1	2	0	0	0	0	0	3	0	0	0		

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	3	3	2	12
TOTAL	15	15	10	60

Government College of Engineering, Karad

Third Year (Sem – V) B. Tech. Civil Engineering

CE 2546: (Elective I) Appropriate Technology

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

Course Outcomes (CO)

1.	Familiarise various aspects of appropriate technology for rural development
2.	Identify various energy sources and apply them for rural development
3.	Possesses and suggest suitable technology for rural development
4.	Suggest remedial measures for problems that may arise in rural development

	Course Contents	Hours
Unit 1	**Introduction :** Rural Energy Consumption pattern, Agriculture and Animal Husbandry, Socio-economic profile of people, Evaluation of new energy sources	**(05)**
Unit 2	**Rural Energy Sources :** Solar Energy – Availaibility and needs, Methods of storage, Solar lighting and water heater, Wind Energy – wind turbine, wind mill and water pumping,	**(05)**
Unit 3	**Rural Transport**: Animal driven carts – Analysis and design for improved models of bullock carts, Rural road design and construction	**(05)**
Unit 4	**Rural Housing :** Systematic approach to rural housing, Alternate building technology, Low cost housing	**(05)**
Unit 5	**Biogas Energy** : Biogas technology, Performance and optimisation of plant dimensions, Novel biogas plant.	**(05)**
Unit 6	**Rural Water Supply and Sanitation** – Hand pumps, Surface drinking water to rural population, Rural sanitation problems and remedies	**(05)**

Tutorials

Text Books

1.	Rural Technology, Amulya Kumar, N.Reddy
2.	Handbook of low cost housing, Lal A.K.,
3.	Rural Energy Consumption – Problems and Prospects, Veena D.R.

Reference Books

1.	Hazeltine, B.; Bull, C. (1999). *Appropriate Technology: Tools, Choices, and Implications*. New York: Academic Press. pp. 3, 270. ISBN 0-12-335190-1.
2.	WHO and UNICEF *Progress on Drinking-water and Sanitation: 2012 Update*, WHO, Geneva and UNICEF, New York

Useful Links

1.	Rural and Urban Society https://nptel.ac.in/courses/109/104/109104047
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
6.	https://www.courses.com/civil-engineering
7.	www.khanacademy.org

Government College of Engineering, Karad

Third Year (Sem – V) B. Tech. Civil Engineering

CE 2556: (Elective I) Repairs and Rehabilitation of Structures

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

Course Outcomes (CO)

1.	Able to interpret and assess various damages along with causes in existing structure
2.	Able to apply various destructive and non-destructive testing on structure to analyse durability and stability of structure
3.	Able to evaluate different causes of failure and weakness of structure
4.	Able to understand and suggest desirable methods and technique to repair, strengthening of existing structures along with cost effectiveness.

	Course Contents	Hours
Unit 1	**Introduction:** Aging of structures, assessment procedure, causes of deterioration, need for repair and rehabilitation, performance of structures, Inspection, Maintenance	**(06)**
Unit 2	**Distress in load bearing, RCC, steel structures:** Damage, source, cause, effects of damage, case studies. Effects of climate, temperature, Corrosion, Strength, Durability and Thermal properties of building materials.	**(07)**
Unit 3	**Damage assessment and Evaluation methods:** Damage testing methods, Non-destructive Testing Techniques (NDT), destructive testing method, Core samples	**(07)**
Unit 4	**Repairing methods and techniques:** Guniting and Shotcreting, grouting, Crack ceiling, Polymer concrete, Fiber wrapping techniques, steel plate flitching, Case studies.	**(07)**
Unit 5	**Retrofitting methods:** Seismic Retrofitting of reinforced concrete buildings, Considerations in retrofitting of structures; Source of weakness in RC frame building, Structural damage due to discontinuous load path, Quality of workmanship and materials, Jacketing	**(06)**
Unit 6	**Repair and maintenance of buildings:** IS standards, Bridge repairs, Seismic strengthening, Estimation and costing of repairing techniques such as jacketing, grouting, polymer mortar etc.	**(07)**

Tutorials

Text Books

1.	R.N.Raikar, "Diagnosis and treatment of structures in distress", Published by R&D Centre of Structwel Designers & Consultants Pvt. Ltd., Mumbai, 1994.
2.	Bridge Rehabilitation by V K Raina
3.	"Building Failures – Diagnosis and Avoidance" by W H Ranson
4.	Forensic Engineering by Kenneth and Carper.

Reference Books

1.	Dr B. C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, "Reinforced Concrete Structures – Vol. II", Laxmi Publications.
2.	Dr V. K. RAINA,"Concrete Bridge Practice, Analysis, Design and Economics", Tata McGraw- Hills Publishing Company Limited.
3.	S. Ponnuswamy, "Bridge Engineering", Tata McGraw-Hills Publishing Company Limited.
4.	Ravishankar.K., Krishnamoorthy, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
5.	R.N. Raikar, "Diagnosis and treatment of structures in distress", Published by R&D Centre of Structural Designers & Consultants Pvt.Ltd., Mumbai, 1994
6.	Handbook on Repair and Rehabilitation of RCC buildings, Published by CPWD, Delhi, 2002.

Useful Links

1.	https://www.youtube.com/watch?v=w308Si7DriU

2.	https://www.youtube.com/watch?v=3SW_K2G9mcI

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	M	L	L	M	L	L	L	L		L			H	H
CO 2	M	M	L	M	H	L		L		L		L	H	H
CO 3	M	H	L	M	L	L	L	M	L	L			H	H
CO 4	H	M	M	L	L	M	H	H		H	M	H	H	H

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

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	2	2	3	7
Understand	4	5	2	7
Apply	8	7	1	12
Analyse	3	3	1	10
Evaluate	2	2	2	10
Create	1	1	1	4
TOTAL	30	30	10	60

Government College of Engineering, Karad				
Third Year (Semester – V) B. Tech. Civil Engineering				
CE2507: Transportation Engineering Lab				
Laboratory Scheme			**Examination Scheme**	
Practical	2 Hrs/ Week		**CA**	25
Total Credits	1		**ESE**	25

Course Outcomes (CO)

Students will be able to:

1.	understand the objective of conducting various tests on highway materials.
2.	perform the experiments and draw conclusions from the results obtained.
3.	apply the knowledge of material properties in designing the paving mixes.

Course Contents

Experiment 1	Determination of water absorption & specific gravity value by IS 2386 (Part III) 1963 method
Experiment 2	Determination of Los Angeles abrasion value by IS 2386 (Part IV) 1963 method
Experiment 3	Determination of soundness test by IS 2386 (Part V) 1963 method
Experiment 4	Determination of shape index by IS 2386 (Part I) 1963 method
Experiment 5	Determination of silt content in fine aggregates by IS 2386 (Part 2) method
Experiment 6	Determination of penetration value of bitumen by IS 1203 – 1978 method
Experiment 7	Determination of softening point value by IS 1205 – 1978 method
Experiment 8	Determination of flash & fire point value by IS 1209 – 1978 method
Experiment 9	Determination of ductility value by IS 1203 – 1978 method
Experiment 10	Determination of viscosity value by IS 1206 – 1978 method
Experiment 11	Determination of stripping value by IS 6241 – 1971 method
Experiment 12	Determination of Marshall stability value by asphalt Institute MS-2 procedure
Experiment 13	Determination of CBR Value of soil by IS 2720 Part 16 1979 method
Experiment 14	Determination of FDD by sand replacement by IS 2720 Part 28 1974 method

Note:

Any 10 experiments from the above to be conducted

End semester exam will be evaluated on the basis of performance (15marks) and viva (10 marks)

Reference Material:

1.	IS 2386-Part I to V (1963) method of test for aggregate for concrete
2.	IS 1201 to 1220 (1978) methods for testing Tar and Bituminous material
3.	IS 6241 (1971) method of test for determination of stripping value of road aggregate
4.	IS 2720 Part 16 1979 method for California Bearing Ratio of Soil
5.	IS 2720 Part 28 1974 method for Field Dry Density of Soil
6.	Asphalt institute MS-2 manual for Marshall stability test

List of Submission:

1.	Test procedure with findings for each experiment in requisite format

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

Assessment Pattern:

For individual student, every experiment will be assessed as per following criteria and average marks will be awarded to the student.

Task I	Proactive Attentiveness: Punctual in attending laboratory sessions/ Field visits	**05 Marks**
Task II	Core Competency: Performance/ Teamwork/ Learning Attitude	**10 Marks**
Task III	Submission/ Neatness/ Writing Skills/ Analysis and Interpretation	**10 Marks**

Skill Level (as per Continuous Assessment 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	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**

Government College of Engineering, Karad

Third Year (Semester – V) B. Tech. Civil Engineering

CE2508: Mini Project

Laboratory Scheme			Examination Scheme	
Practical	2Hrs/ Week		**CA**	**50**
Total Credits	1		**ESE**	**50**

Course Outcomes (CO)

Students will be able to:

1.	identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
2.	demonstrate the important attributes like critical thinking, creativity, collaboration efforts and communication skills in students.
3.	work as an individual or in a team in the development of technical projects.
4.	formulate project report related activities and aware of the process involved in making product from an idea.

Course Contents

Minor projects shall consist of followings but not limited to

Minor experimental work of various techno-social issues, computer based analysis and design, structural design, Structural audit of various civil engineering works, health monitoring of structures, Innovative civil engineering materials, Environmental impact assessment, design of small water supply schemes, irrigation schemes, water harvesting, sewerage system, waste management system, etc. related to civil engineering.

(For purchase of consumables required for completion of project, every project batch shall receive funding from institute with maximum limit decided by BoM, GCE Karad)

The steps involved for completion of minor project includes, but not limited to:

a. Conceptualization of innovative idea through literature and market survey; extensive survey; site visits; interaction with community or industry, socio-economic survey etc.
b. Design of product, processes, methods, and systems using multidisciplinary knowledge.
c. Fabrication of product, development of software, measurement methods etc.
d. Deployment, implementation, and demonstration of project.
e. Presentation of project

Project Report Format:

Project report should be of 15 to 20 pages (typed on A4 size sheets).

For standardization of the project reports the following format should be strictly followed.

Page Size: Trimmed A4

Top Margin: 1.00 Inch; **Bottom Margin:** 1.32 Inches; **Left Margin:** 1.5 Inches; **Right Margin:** 1.0 Inch

Para Text: Times New Roman 12 Point Font; **Line Spacing:** 1.5 Lines

Headings: Times New Roman, 14 Point Bold Face

Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman

Certificate: All students should attach standard format of Certificate as described by the department. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal, GCE Karad.

Index of Report:

a. Title Sheet
b. Certificate
c. Acknowledgement
d. Table of Contents
e. List of Figures
f. List of Tables
g. Body of report

References: References should have the following format:

For Books: “Title of Book”, Authors, Publisher, Edition.

For Papers: “Title of Paper”, Authors, Journal/Conference Details, Year

Teaching Load

One faculty from the department as a supervisor shall be assigned one project batch of maximum 5 studentsfor the mini project. In such cases, the weekly load for the supervisor will be 2Hr/week.

Assessment Pattern:

The continuous assessment shall be done by the supervisor based on attributes like critical thinking, creativity, collaborative efforts and communication skills in the students. The department shall arrange exhibition (all department will arrange the exhibition on the same day) for the mini projects done by students and the referee will judge the project work in accordance with the outcomes of the course by interacting with students and marks will be awarded to individual student. This exhibition will remain open for all students, parents, and other citizens visiting the exhibition.

Note:ESE will be conducted by the External Examiner with rubrics provided.

List of Submission:

- Working model of the project
- Project Report in specified format only
- Presentation and demonstration of project in exhibition

Mapping of COs and POs

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

Assessment Pattern:

Skill Level	CA
Critical thinking	10
Creativity	10
Collaborative efforts and Communication skills	10
Report Writing	10
Presentation Skill	10
TOTAL	**50**

Government College of Engineering, Karad

Third Year (Semester – V) B. Tech. Civil Engineering

CE2509 : Industrial Training

Teaching Scheme			Examination Scheme	
Tutorial	1 Hr/ Week		**CA**	50
Total Credits	1			

Course Outcomes (CO)

Students will be able to:

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,

I. Construction work.
II. Planning and design.
III. Quantity Estimation.
IV. Survey.
V. Investigations.
VI. 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 Industrial Training

The period of Industrial Training must be after fourth semester and in summer vacations. The student has to devote 90 - 100 man - hours (@ 20 days – 5 hour/day) distributed over the vacations since completion of Second Year B. Tech, Civil Engineering Program.

Reporting and Submission requirements

At the start of fifth semester, 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.

Assessment Pattern

Student must submit finalised report at the end of the semester. Student has to present his/her work to examiner for evaluation.

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	-	-	-	-	-	-

Assessment Pattern (with revised Bloom's Taxonomy)

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

Government College of Engineering, Karad

Third Year (Semester – VI) B. Tech. Civil Engineering

CE2601 : Economics for Engineers

Teaching Scheme			Examination Scheme	
Lectures	2 Hrs/ Week		**CT – 1**	15
Total Credits	2		**CT – 2**	15
			TA	10
			ESE	60
			Duration of ESE	**02 Hours 30 Minutes**

Course Outcomes (CO)

Students will be able to:

1.	understand the basic concepts of engineering economics and accounting.
2.	learn the selection process for the best economic alternative.
3.	determine the effect of depreciation and inflation.
4.	apply the concepts of replacement analysis.

	Course Contents	Hours
Unit 1	**Introduction:** Time value of money, cash flow diagrams, types of interest, economic factors.	**03**
Unit 2	**Economic comparison methods:** Present worth method, annual worth method, capitalised cost method.	**04**
Unit 3	**Depreciation & inflation:** Depreciation, methods of depreciation, inflation and it's adjustment	**05**
Unit 4	**Equipment economics:** Fixed and variable costs of equipment, buy, hire and lease decisions, types of maintenance, economic life of an asset – replacement and retirement decisions.	**03**
Unit 5	**Funding of infrastructure projects:** Equity, debt, types of infrastructure projects, roll of infrastructure projects in economic growth of country, financing infrastructure projects (BOT, BOOT, DBFO, etc.)	**04**
Unit 6	**Construction accounting:** Chart of accounts, balance sheet, profit and loss account, financial ratios, and working capital management.	**05**

Text Books

1.	Panneerselvam R., "Engineering Economics", PHI Publication (2nd Eastern Economic Edition). 2014.
2.	Riggs, "Engineering Economics", McGraw Hills Publication (4th Edition).
3.	Rajkumar & Anil Dhawan , "Basics of Economics & Management", New Central Book Agency Pvt. Ltd..
4.	Grewal T. S., "Accountancy Theory & Practice", S. Chand Publication. 2018.

Reference Books

1.	Ahuja H. L., "Business Economics – Microeconomic Analysis", S. Chand Publication (13th Edition).
2.	Agarwal B. M., "Statistics for Economics", S. Chand Publication. 2019.
3.	Henry Hazlitt, "Economics in one lesson", Harper Publication. 2008.
4.	Sasmita Mishra, "Engineering Economics & Costing", PHI Publication (2nd Edition).
5.	Leland Blank, "Engineering Economy" McGraw Hills Publication (7th Edition).

Useful Links	
1.	NPTEL Course – Civil Engineering – Construction Economics and Finance – Bulu Pradhan , IIT Guwahati – https://nptel.ac.in/courses/105/103/105103023/
2.	NPTEL Course – Humanities and Social Sciences – Macroeconomics Theory and Stabilization Model - Surojit Dinah, IIT Kanpur – https://nptel.ac.in/courses/109/104/109104073/
3.	NPTEL Course – Humanities and Social Sciences – An Introduction to Microeconomics – Vimal Kumar , IIT Kanpur – https://nptel.ac.in/courses/109/104/109104125/
4.	NPTEL Course – Management – Economics, Management and Entrepreneurship – Prataj Mohapatra, IIT Kharagpur – https://nptel.ac.in/courses/110/105/110105067/
5.	NPTEL Course – Humanities and Social Sciences – History of Economic Theory – Shiva Kumar, IIT Madras – https://nptel.ac.in/courses/109/106/109106058/
6.	NPTEL Course – Management – Introduction to Financial Institutes and Systems – Jitendra Mahamud , IIT Kharagpur – https://nptel.ac.in/courses/110/105/110105121/
7.	NPTEL Course – Civil Engineering – Infrastructure Planning and Managements – Asswin Mahalingam, IIT Madras – https://nptel.ac.in/courses/105/106/105106115/
8.	NPTEL Course – Civil Engineering – Introduction to Accounting and Finance for Civil Engineering – Sudhir Misra, IIT Kanpur – https://nptel.ac.in/courses/105/104/105104178/

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

Assessment Pattern (with revised Bloom's Taxonomy)

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

Government College of Engineering, Karad				
Third Year (Sem – VI) B. Tech. Civil Engineering				
CE2612: (Open Elective III) Numerical Methods				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		CT – 1	15
Total Credits	02		CT – 2	15
			TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to

1.	understand various numerical techniques, principles and their applications in civil engineering
2.	apply numerical methods to obtain approximate solution for mathematical problem

	Course Contents	Hours
Unit 1	Matrix operations on computer, multiplication and inversion, Gauss elimination method, Choiesky decomposition method, solution of simultaneous equations, Gauss elimination, Gauss Jordan and Gauss scidal methods.	**(05)**
Unit 2	Roots of equation, Newton Remphson method, trial and error method, bisection, method.	**(05)**
Unit 3	Solution of ordinary differential equation, Euler's method, modified Euler's method and Runga Kutta methods.	**(05)**
Unit 4	Finite difference method, central forward and backward differences, application to deflection of determinate beams, buckling load of long columns of constant, non uniform, stepped variation of moment of inertia.	**(05)**
Unit 5	Numerical differentiation and integration: Trapezoidal rule, Simpon's, 1/3rd rule.	**(05)**
Unit 6	Statistical analysis, mean and standard deviation, least square method, regression analysis – linear parabolic, curve fitting.	**(05)**

Text Books

1.	E. Balaguruswami, "Numerical methods", Tata Mc. Graw. hill.
2.	Chapra. Sc. and R.P.Canale, "Numerical methods for engineers", Tata McGraw hill.

Reference Books

1.	Scheid F, "Numerical analysis (Schaum's series)", Tata Mc. Graw hill.
2.	Shantha Kumar M., "Computer based numerical analysis", Khanna publication.
3.	Grewal B.S., "Numerical methods in engineering and science", by Khanna publication.
4.	Salaria R.S., "Computer oriented numerical methods" by Khanna publication.

Useful Links

1.	NPTEL Course-IIT Bombay-Numerical Methods in Civil Engineering by Prof. Y. M. Desai & Prof. T. I. Eldo http://onlinecourses.swayam2.ac.in/arp20_ap31

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	3	3	2	1	0	0	0	0	0	1	2	2
CO 2	3	3	3	3	2	1	0	0	0	0	0	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				
Third Year (Sem – VI) B. Tech. Civil Engineering				
CE2622: (Open Elective III) Safety Engineering				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		CT – 1	15
Total Credits	02		CT – 2	15
			TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Students will be able to

1.	Understand safety and health regulations and the Indian Standards applicable to the construction industry
2.	Plan, analyze and manage the hazardous construction project sites

	Course Contents	Hours
Unit 1	Basic terminology in safety, types of injuries, safety pyramid, accident patterns, theories of accident-causation	**(06)**
Unit 2	Planning for safety budget, safety culture, introduction to OSHA regulations, role of stakeholders in safety	**(06)**
Unit 3	Site safety programs - Job hazard analysis, accident investigation and accident indices-violation, penalty	**(06)**
Unit 4	Safety during construction, alteration, demolition works, earthwork, steel construction, temporary structures, masonry and concrete construction, cutting and welding	**(06)**
Unit 5	SoPs (Safe Operating Procedures) - Construction equipment, materials handling-disposal and hand tools, Other hazards - fire, confined spaces, electrical safety; BIM and safety	**(06)**

Text Books

1.	Bhattacharjee, S.K. (2011) Safety Management in Construction, Khanna Publishers
2.	Li, R.Y.M. & Poon, S.W. (2013) Construction Safety, Springer Publishers

Reference Books

1.	Hinze, J.W. (1997) Construction Safety, Prentice Hall
2.	MacCollum, D.V. (1995) Construction SafetyPlanning, John Wiley & Sons
3.	Reese, C.D. &Eidson, J.V. (2006) Handbook ofOSHA Construction Safety and Health, Taylor & Francis.
4.	Lingard, H. &Rowlinson, S. (2005) Occupationalhealth and Safety in Construction Project Management, Spon Press.
5.	Holt, A.S.J. (2005) Principles of Construction Safety,Wiley-Blackwell Publishers
6.	MacCollum, D.V. (2007) Construction Safety Engineering Principles, McGraw Hill Publishers

Useful Links

1.	NPTEL Course-IIT Delhi-SafetyinConstruction by Dr. J. Uma Maheswari http://onlinecourses.nptel.ac.in/noc21_ce16

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	3	3	1	3	2	1	1	2	2	1	2	2
CO 2	3	3	3	3	3	3	2	1	1	2	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	3	3	2	12
Analyse	2	2	2	12
Evaluate	2	2	2	12
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Third Year (Sem – VI) B. Tech. Civil Engineering

CE2632: (Open Elective III) Project Management

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

Course Outcomes (CO)

Students will be able to –

1.	understand fundamentals of projects.
2.	learn the roles of project team including project manager.
3.	prepare plan and collect required finance for project .
4.	schedule and monitor the project.

	Course Contents	Hours
Unit 1	**Introduction –** Concepts and definitions of projects, Life cycle of projects, Project stakeholders, Project formulation, Project management as a profession.	**(03)**
Unit 2	**Project Manager –** Roles and responsibilities of project manager, Project team, Project planning, Project selection methods, Multidisciplinary teams.	**(03)**
Unit 3	**Project Finance –** Methods of project financing, Capital budgeting, Cost estimating, Budget uncertainty,	**(04)**
Unit 4	**Project Scheduling –** Gantt Chart, Work breakdown structure in projects, Scheduling projects with CPM and PERT networks, Risks associated with projects.	**(04)**
Unit 5	**Project Monitoring –** Data collection and reporting, Earned value concept, Project control and project management information systems.	**(04)**
Unit 6	**Project Closure –** Project reports, Closure process, Project auditing, Project evaluation, Dispute resolution, Emerging trends in project management.	**(04)**

Text Books

1.	Meredith Jack R. et.al. Project Management, Wiley India Edition, 2016
2.	Grey Clifford *et al*, "Project Management", 2010 Edition, Tata McGraw Hill Inc., New Delhi.
3.	Gopalan M.R. "Project Management", Routledge Wiley.

Reference Books

1.	Meredith Jack *et al.*, "Project Management", 2017 Wiley.
2.	Mantel Samual *et al* , Project Management, Wiley India
3.	Chitkara K.K. Construction Project Management, McGraw Hill Education (India) Pvt, Ltd. 2014
4.	Jha Kumar N. Construction Project Mangement, Pearson India Education services Pvt. Ltd., 2015
5.	Choudhury S., Project Management, Tata McGraw Hill Publishing Company Ltd. 2014

Useful Links

1.	NPTEL Course – Project Management – By Prof. Raghunandan Sengupta, IIT Kanpur – https://nptel.ac.in/courses/110/104/110104073/
2.	NPTEL Course – Project Management for Managers – By Prof. Mukesh Kumar Barua., IIT Roorkee – https://nptel.ac.in/courses/110/107/110107081/#
3.	NPTEL Course – Project Planning and Control – By Prof. Koshy Varghese, IIT Madras – https://nptel.ac.in/courses/105/106/105106149/#

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	1	2	1	1	1	2	0	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	0	0	0	2	3	3	1	2
CO 4	3	3	3	3	2	1	1	3	3	3	3	3	1	2

Assessment Pattern

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	-	2	06
Understand	5	5	2	18
Apply	5	5	2	18
Analyse	-	5	2	12
Evaluate	-	-	2	06
Create	-	-	-	-
TOTAL	**15**	**15**	**10**	**60**

***

Government College of Engineering, Karad

Third Year (Semester – VI) B. Tech. Civil Engineering

CE 2613 : (Elective-II) Advanced Geotechnical Engineering

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		**CT – 1**	15
Total Credits	3		**CT – 2**	15
			TA	10
			ESE	60
			Duration of ESE	**02 Hours 30 Minutes**

Course Outcomes (CO)

Students will be able to:

1.	explain the foundation types for large axial and lateral loads.
2.	recognize conventional as well as modern methods of reinforced walls.
3.	implement the foundations with static loads and kinetic forces using machine foundation concepts.
4.	explain different types of bulkheads and braced cuts.
5.	explain the methods to be followed during construction of foundations in water.

	Course Contents	Hours
Unit 1	**Drilled piers:** Types of drilled piers, methods of construction, design considerations, load bearing capacity in granular soil and clay. **Caissons:** Design and construction of open caissons, construction of pneumatic caissons, stability of floating caisson, advantages and disadvantages.	**06**
Unit 2	**Reinforced earth wall:** Metal strip reinforcement, metal mesh reinforcement, geotextile reinforcement, geo-grid reinforcement, geo-membrane reinforcement, designing of metal strip reinforcement, introduction to gabion wall.	**05**
Unit 3	**Machine foundations:** Types, general criteria for design, vibration analysis, design of foundations for reciprocating and impact machines as per IS code.	**05**
Unit 4	**Bulkheads:** Types of sheet pile wall, cantilever sheet pile wall embedded in granular soil and in cohesive soil, anchored bulkhead driven into granular soil, anchored bulkhead embedded in cohesive soil, design of anchors.	**05**
Unit 5	**Braced cuts:** General considerations, lateral earth pressure distribution on braced cuts, apparent pressure diagrams, deep cuts in sand, cuts in saturated clay, cuts in stratified soils, stability of braced cuts in saturated clay.	**05**
Unit 6	**Well foundations:** Forces acting on well foundation, Terzaghi's method, IRC method, Well Sinking, Practical Difficulties and Remedial Measures. **Coffer Dams:** Types of coffer dams, design of cellular coffer dams on soil and rock.	**06**

Text Books

1.	Punmia B. C., "Soil Mechanics and Foundation Engineering", Laxmi Publications.
2.	Arora K. R., "Soil Mechanics and Foundation Engineering", Standard Publishers, New Delhi.
3.	Murthy V. N. S., "Soil Mechanics and Foundation Engineering", CBS (1st edition).
4.	Samasher Prakash, "Soil dynamics", McGraw Hill Higher Education.1981.
5.	Joseph E. Bowles, "Foundation Analysis and Design", McGraw Hill International Book Company (Student Edition).

Reference Books

1.	Terzaghi K. & Peck R. B., "Soil Mechanics in Engineering Practice", Wiley (3rd Edition)
2.	Nayak N. V., "Foundation Design Manual", Dhanpat Rai Publications, New Delhi.
3.	Murthy V. N. S., "Advanced Foundation Engineering", CBS Publishers & Distributors, New Delhi.
4.	Dass B. M., "Foundation Engineering", Cengage Learning (7th Edition).
5.	Relevant Indian Standard Specifications and Codes

Useful Links	
1.	NPTEL Course – Civil Engineering – Foundation Engineering – Mahendra Singh, Priti Maheswari and N.K. Samadhiya, IIT Roorkee – https://nptel.ac.in/courses/105/107/105107120/
2.	NPTEL Course – Civil Engineering – Advanced Foundation Engineering – T. G. Sitharam, IISC, Banglore – https://nptel.ac.in/courses/105/108/105108069/
3.	NPTEL Course – Civil Engineering – Geotechnical Engineering II Foundation Engineering – Dilip Kumar Baidya, IIT Kharagpur – https://nptel.ac.in/courses/105/105/105105185/
4.	NPTEL Course – Civil Engineering – Advanced Geotechnical Engineering – B.V.S. Viswanadham, IIT Bombay – https://nptel.ac.in/courses/105/101/105101001/

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	1	2	1	-	-	1	3	-	-	-	1	1	1
CO 2	2	2	1	1	-	-	-	2	-	-	2	-	2	2
CO 3	2	1	2	1	1	-	1	-	1	-	2	1	1	1
CO 4	-	2	3	-	1	-	1	-	-	1	-	1	1	1
CO 5	2	1	1	-	2	-	-	-	1	-	2	1	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

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

Government College of Engineering, Karad

Third Year (Sem – VI) B. Tech. Civil Engineering

CE 2623: (Elective II) Building Services

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

Course Outcomes (CO)

1.	Students will be able to identify and draw various plumbing system components and electrical fitting components in buildings.
2.	Students will be able to understand requirements and types of ventilation systems , thermal insulation and fire resistance system as per National Building Code (SP-7)
3.	Students will be able to understand standards regarding acoustics in buildings and sound insulation as per NBC (SP-7)
4.	Students will be able to understand types of vertical circulation and paints in buildings

	Course Contents	Hours
Unit 1	**Plumbing and electrification in buildings** :Plumbing systems, material used for service pipes, valves- function and types, fitting and taps, sanitary fittings- water closet, flushing cistern, wash basin, sink, urinals, traps- types and requirements, rain water harvesting system. Concealed and open wiring, requirements and location of various points, accessories of electrical installation, concept of earthing.	**(08)**
Unit 2	**Ventilation:** - Definition and necessity of ventilation, functional requirement, various system and selection criteria. Air conditioning: - purpose, classification, principles, systems and various components of the same.	**(07)**
Unit 3	**Fire protection in buildings:** Fire protection precautions, confining of fire, fire hazards, characteristics of fire resisting materials, building materials and their resistance to fire	**(05)**
Unit 4	**Acoustics and Sound Insulation in buildings:** Introduction to acoustics: Absorption of sound, various materials, conditions for good acoustics. Sound Insulation and methods of noise control.	**(06)**
Unit 5	**Thermal insulation and painting in buildings:** - General concept, materials, methods Paints: Different types and application methods.	**(05)**
Unit 6	**Vertical Circulation in the Building:** Stairs: Technical terms, requirements of a good stair, uses, types, ramps, lifts and escalator.	**(05)**

Tutorials

Text Books

1.	Building Design by Shah, Kale, Patki. Tata Mc-Graw Hill Publications. (Edition 2015)
2.	Building Construction by B.C. Punmia (Edition 2015)
3.	

Reference Books

1.	National Building code SP-7.(Edition 2016)
2.	Building Services Handbook by Fred Hall and Roger Greeno

Useful Links

1.	https://ocw.mit.edu/courses/architecture/4-401-introduction-to-building-technology-spring-2006/lecture-notes/

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	L					L	L						L	L
CO 2	L					L					L		L	L
CO 3	L					L	L						L	L
CO 4	L					L	L						L	L

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	4	20
Understand	5	5	4	20
Apply	5	5	2	20
Analyse				
Evaluate				
Create				
TOTAL	15	15	10	60

Government College of Engineering, Karad

Third Year (Semester – VI) B. Tech Civil Engineering

CE 2633: (Elective II) Hydraulics in Environmental Engineering

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

Course Outcomes (CO)

Students will be able to

1.	explain and apply hydraulics of environmental facilities.
2.	analyse and evaluate the distribution and collection systems.
3.	design the distribution, collection and treatment facilities in environmental systems hydraulically.

	Course Contents	Hours
Unit 1	**Pumped and Gravity Water Mains –** Review of closed conduit hydraulics: continuity and energy equation, head loss calculation, sizing water mains: classification of problems, design flow, design of pumped and gravity system of water mains, concept of optimal design, economic design of pumped and gravity water mains pumping system: design of water pumping system.	**(05)**
Unit 2	**Water Distribution System –** Water Distribution System (WDS): types of network, water demand allocation, types of problem, network hydraulics, types of simulation, flow, node and loop equations, analysis and design of WDS: linear theory, and Newton-Raphson methods, design, use of optimization WDS design, WDS testing: fundamentals, pressure and flow measurement, Calibration: Overview of hydraulic calibration, approaches, application of computer models: WDS analysis and design, identifying and solving common WDS problems, extension of WDS, rehabilitation, calibration, pipe breaks and water loss: causes, leak detection, evaluation of leak detection.	**(08)**
Unit 3	**Sanitary Sewerage Systems –** Review of sewer hydraulics: velocity of flow, hydraulic formulae, gradient, types of sewer, design of sanitary sewerage system: estimation of design flow, design considerations, procedure, design of sanitary sewer system, use of computer models for design.	**(05)**
Unit 4	**Storm-water drainage system –** Storm water drainage system: need and design objectives of storm water conveyance system, system components and design process, peak flow estimation by rational and SCS method, hydraulic analysis of roadway gutter and inlets, design of storm sewer system, use of computer model for analysis and design.	**(05)**
Unit 5	**Plumbing and Rainwater Harvesting System –** Plumbing system: terminology, principles of water supply and drainage system in buildings, design of water supply and drainage system in multistoried building, rainwater harvesting: need and concept of rainwater harvesting, systems of rainwater harvesting, roof top harvesting of rainwater, components, estimation of water collection potential, design considerations, design of a roof top harvesting system.	**(08)**
Unit 6	**Hydraulic Design of Treatment Facilities –** Hydraulic design of treatment facilities: hydraulic design of water and wastewater treatment facilities, Preparation of hydraulic profiles, Plant layout.	**(05)**

Text Books

1.	Hammer M. J. and Hammer M. J., "Water and Wastewater Technology", PHI Learning Private Limited, 6th Edition.
2.	Walski, Chase and Savic, "Water Distribution Modeling", Haestad Press, First Edition.
3.	Peavy H. S., Rowe D. R. and Tchobanoglous G. "Environmental Engineering", McGraw-Hill Book Company, International Edition.

Reference Books

1.	Haestad - Durrans, "Storm Water Conveyance Modelling and Design", Haestad Press, First edition.
2.	"Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, GoI, New Delhi.
3.	"Manual on Sewerage and Sewage Treatment", CPHEEO, Ministry of Urban Development, GoI, New Delhi.
4.	Sincero A. P. and Sincero G. A. "Environmental Engineering a Design approach", PHI learning private limited.

Useful Links	
1.	NPTEL Course – Civil Engineering – Water Supply Engineering – Prof. Manoj Kumar Tiwari - IIT Kharagpur – https://nptel.ac.in/courses/105/105/105105201/
2.	NPTEL Course – Civil Engineering – Wastewater management – Prof. M. M. Ghangrekar – IIT Kharagpur – https://nptel.ac.in/courses/105/105/105105048/
3.	NPTEL Course – Civil Engineering – Hydraulics – Prof. Arup Kumar Sharma – IIT Guwahati – https://nptel.ac.in/courses/105/103/105103096/

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	0	0	0	1	0	0	0	0	2	1	2
CO 2	2	1	2	2	2	2	3	1	0	0	0	2	2	2
CO 3	3	2	3	2	0	2	3	1	2	0	0	3	2	1

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

Third Year (Sem – VI) B. Tech. Civil Engineering

CE 2643: (Elective II) Advanced Construction Practices

Teaching Scheme			Examination Scheme	
Lectures	3Hrs/week		CT – 1	15
			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.	Classify, compare and choose appropriate construction materials and techniques for a particular construction activities.
2.	Prepare method statements for large and heavy construction projects.
3.	Select appropriate formwork for the construction projects.
4.	Describe concept of intelligent and energy efficient buildings

	Course Contents	Hours
Unit 1	Concrete construction for Engineering projects: Selection of equipment's for batching , mixing, transporting, placing and compacting for various types of jobs, safety measures during concreting, special concretes and mortars, concreting under water	**(07)**
Unit 2	Prefabricated Construction: Planning for pre-casting, Types, Sizes and Economy, Fabrication techniques, selection of equipment for fabrication, transport and erection, quality measures, safety measure during erection.	**(07)**
Unit 3	Ground Improvement and Dewatering Techniques : Soil distribution in India, Reclaimed Soils, selection for field compaction procedures, compaction quality control, soil reinforcement, thermal methods, improving rock stability and quality- Grouting Methods- pumping, well points, bored wells, electro-osmosis, injections with cement, clays and chemical, freezing process, vibro-flotation	**(08)**
Unit 4	Composite Construction: Composite v/s Non Composite Action; Composite Steel-Concrete Construction, types of composite construction, Materials used in composite construction	**(07)**
Unit 5	Temporary Works: Form work for R.C.C. wall, slab, beam and column, design features for temporary works, Slip formwork, False work for bridges, Specialty form work- tunnel formwork, table formwork, case studies.	**(06)**
Unit 6	Energy Efficient Buildings: Introduction, Typical energy flow in buildings ,Determining a building's energy performance, energy efficiency measures for buildings,passive solar architecture, HVAC	**(05)**

Text Books

1.	Peurifoy R. L, "Construction, Planning, Equipment and methods", McGraw hill book corp., New Delhi 2016
2.	S.P. Arora & S.P. Bindra, A Text Book of Building Construction, Dhanpat Rai & Sons, New Delhi 2017
3.	B.C. Punamia, Building Construction, Laxmi Publications, New Delhi 2000

Reference Books

1.	S.K. Duggal Building Materials, New Age International Publications 2006.
2.	Ashby, M.F. and Jones.D.R.H.H. "Engineering Materials 1: An introduction to Properties, applications and designs", Elsevier Publications, 2005.
3.	Stubbs, handbook of heavy Construction
4.	Dr. P. Purushothamma Raj, Ground Improvement Techniques, Laxmi Publications
5.	Journals published by various agencies related to construction

Useful Links

1.	https://nptel.ac.in/noc/courses/noc21/SEM1/noc21-ce19/
2.	https://nptel.ac.in/courses/105/106/105106144/
3.	https://nptel.ac.in/courses/124/105/124105013/
4.	https://nptel.ac.in/courses/105/102/105102175/

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

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	4		2	15
Understand	5	5	2	15
Apply	5	5	2	15
Analyse	1	5	2	15
Evaluate			2	
Create				
TOTAL	15	15	10	60

Government College of Engineering, Karad

Third Year (Sem – VI) B. Tech. Civil Engineering

CE2653: (Elective II) Advanced Structural Analysis

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

Course Outcomes (CO)

Student will be

1.	able to remember and understand laws and principles related to material behaviour under loading.
2.	able to apply methods to solve problems in structural analysis..
3.	able to asses values of reactive parameters in structures under different loading conditions.
4.	able to predict behaviour of structures and make necessary inferences required for design.

	Course Contents	Hours
Unit 1	Influence line diagrams for indeterminate structure: Muller Breslau principle, I.L.D. for propped cantilever, two span continuous beam	**(08)**
Unit 2	Fixed arches: analysis of fixed arches by elastic center method beams curved in plan: determinate and indeterminate beams curved in plan.	**(08)**
Unit 3	Approximate method of analysis of multi-storey frames: analysis of portal frames subjected to lateral loads – portal method, cantilever method	**(08)**
Unit 4	Asymmetrical Bending: shear center for thin walled beam section symmetrical about one axis	**(08)**
Unit 5	Analysis of space trusses by tension coefficient method analysis of secondary stresses in plane frames	**(08)**
Unit 6	Introduction to theory of elasticity– (Treatment in Cartesian coordinates), state of stress at point, stress equilibrium equations, strain components, stress-strain relation, generalized Hooke's law, plane stress and plane strain conditions, stress and strain compatibility for 2 D.	**(08)**

Tutorials

Tutorials shall consist of minimum six assignments based on above syllabus with at least four problems from each unit

Text Books

1.	C.S.Reddy ,"Basic structural Analysis", Tata McGraw Hill, Delhi, 2nd edition
2.	S. B. Junnarkar& H.J. Shah "Mechanics of Structures" Vol. II & III, Charotar Publishing House, Anand

Reference Books

1.	Norris and Wilbur, "Elementary Structural Analysis", McGraw Hill Inc., 4th Edition
2.	Negi and Jangid, "Structural Analysis", Tata McGraw Hill Pub. Co. Ltd.
3.	Timoshenko, "Strength of Materials Vol.-II", East-West Press ltd. Delhi
4.	Vazirani and Ratwani, "Analysis of Structures Vol.-II", Khanna Publishers, Delhi
5.	B.C. Punmia and A.K. Jain, "Design of Steel Structures", Laxmi Publication Ltd. Delhi
6.	S.P. Timoshenko and J.N. Goodier, "Theory of Elasticity", Tata McGraw-Hill Publishing Co. Ltd., 3rd edition

Useful Links

1.	http://nptel.ac.in/courses/105105109/pdf/m6l36.pdf
2.	https://www.youtube.com/watch?v=7ZR1p2K-gdI

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

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	02	02	01	08
Understand	03	03	01	12
Apply	02	02	02	08
Analyse	03	03	01	12
Evaluate	05	05	05	20
Create				
TOTAL	15	15	10	60

Government College of Engineering, Karad

Third Year (Semester – VI) B. Tech. Civil Engineering

CE2604 : Limit State Design of Concrete Structures

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/ Week		**CT – 1**	15
Total Credits	3		**CT – 2**	15
			TA	10
			ESE	60
			Duration of ESE	**03 Hours**

Course Outcomes (CO)

Students will be able to:

1.	understand principles related to different design philosophies.
2.	apply appropriate design methods to design different RCC structural members.
3.	assess values of various parameters in RCC structural member under different loading conditions.
4.	predict behaviour of RCC structural member and make necessary inferences according to design.

	Course Contents	Hours
Unit 1	**Introduction:** Stress - Strain behaviour of concrete and steel, behaviour of RCC, permissible stresses in steel and concrete, different design philosophies, various limit states, characteristic strength and characteristic load, load factor, partial safety factors, stress block parameters.	**06**
Unit 2	**Limit state of collapse (flexure):** Analysis and design of singly and doubly reinforced rectangular sections, singly reinforced T and L beams.	**06**
Unit 3	**a) Limit state of collapse (shear and bond):** Shear failure, design of shear reinforcement, bond - types, factors affecting bond resistance, check for development length. **b) Limit state of serviceability:** deflection criteria, cracking - classification and types of cracks, causes, mechanism, and IS recommendations.	**06**
Unit 4	**a) Design of slabs:** Cantilever slabs, simply supported one way slab, two way slabs with different support conditions. **b) Design of staircase:** simply supported single flight staircase and dog legged staircase.	**06**
Unit 5	Analysis and design of axially and eccentrically loaded circular and rectangular columns, interaction diagrams, circular column with helical reinforcement.	**06**
Unit 6	Design of isolated rectangular column footing with constant depth subjected to axial load and moment, design of combined rectangular footing, introduction to eccentric footing (numerical are not expected)	**06**

Text Books

1.	Sinha N. C. and Roy S. K., "Fundamentals of Reinforced Concrete", S. Chand Publications (4th edition). 2013.
2.	Punmia B. C., Jain A. K. and Jain A. K., "Comprehensive Design of R. C. Structures", Laxmi Publications (10^{th} Edition). 2015.
3.	Shah V. L. and Karve S. R., "Limit State Theory and Design", Structures Publications (8^{th} Edition). 2014.
4.	Jain A. K., "Reinforced Concrete: Limit State Design", (7^{th} Edition). 2012.

Reference Books

1.	IS 456 - 2000: Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standard, New Delhi.
2.	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 (2^{nd} Revision).
3.	IS 875 (Part 2): Code of practice for Design Loads (other than earthquake) for buildings and structures. Part 2: Imposed loads (2nd Revision).
4.	Varghese P. C., "Limit State Design of Reinforced Concrete", Prentice - Hall of India Pvt. Ltd. (2^{nd} Edition). 2004.
5.	Gambhir M. L. and McMillan, "Reinforced Concrete Design", PHI Learning Pvt. Ltd. (4thEdition). 2006.

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	2	2	2	10
Understand	2	2	2	10
Apply	3	3	2	10
Analyse	4	4	2	15
Evaluate	4	4	2	15
Create	0	0	0	0
TOTAL	15	15	10	60

Government College of Engineering, Karad

Third Year (Semester – VI) B. Tech. Civil Engineering

CE2605 : Quantity Surveying and Valuation

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/ Week		**CT – 1**	15
Total Credits	3		**CT – 2**	15
			TA	10
			ESE	60
			Duration of ESE	**03 Hours**

Course Outcomes (CO)

Students will be able to:

1.	prepare approximate and detailed estimate as per the prevailing standards.
2.	carry out rate analysis of construction items.
3.	compute the valuation of the property.
4.	introduced to the legal aspects of construction contracts

	Course Contents	Hours
Unit 1	**Introduction:** Purpose of quantity estimates, types of estimates, various items to be included in estimates, modes of measurement and units of measurement as per codal provision, administrative approval and technical sanction to estimates, introduction to DSR (District Schedule Rate) and CSR (common schedule of rates); **Approximate estimates:** Purpose, methods for buildings and other civil engineering works; **Taking out the quantities**: Long wall - short wall method and centre line method, measurement sheet and abstract sheet.	**06**
Unit 2	**Specifications:** Purpose, types, basic principles and drafting of detailed specifications for materials, quality, workmanship, National Building Code; **Analysis of rates:** Factors affecting cost of an item work, materials, sundries, labour, tools and plant, overheads and profit, task work- definition and factors affecting task work, work charge establishment, analysis of rates of items related to building, prime cost, provisional sum and provisional quantities.	**06**
Unit 3	**Detailed Estimates:** Buildings, R. C. C works including bar bending schedule, culverts, earthwork, and roads including hill roads.	**07**
Unit 4	**Tenders:** Categories, tender notice, notification in media, e - procurement, preparation and submission of tenders, tenders forms, EMD and SD, revocation of tenders, opening of tenders, qualification of contractors, pre-bid conference, scrutiny of tenders, unbalanced tenders, acceptance of tenders, running bills and final bills.	**05**
Unit 5	**Contracts:** General idea, types of contracts namely lump-sum, item rate, percentage rate, cost plus, target, turnkey contracts, Engineering Procurement Construction (EPC), conditions of contracts, law of contract, definition, objective and essentials of valid contract, termination and breach of contracts, negotiated contracts, demolition contracts, disputes, arbitration, FIDIC, introduction to non-conventional contract, PWD & WRD organizations, introduction to RERA.	**06**
Unit 6	**Valuation:** Purpose, value, cost and price, different types of values, rent fixation, tenure of land, free hold and lease hold property, depreciation, straight line method, balance declining method and sinking fund method, capitalized value and annualized value of an old building, different methods of valuation, preparation of valuation report.	**06**

Text Books

1.	Rangwala S. C., "Elements of Estimating and Costing", Charotar Publishing House (41st Edition). 2019.
2.	Dutta B. N., "Estimating and costing", Dhanpat Rai and Sons (28th Edition). 2016.
3.	Bhasin P. L. and Chand S., "Quantity Surveying", (3rd Revised Edition). 1987.
4.	Patil B. S. "Civil Engineering Contracts and Estimates", Universities Press Pvt. Ltd. (4th Edition). 2015.
5.	Birdie G. S., "Estimating and Costing", Dhanpat Rai and Sons (6th Edition). 2005.
6.	Chakraborti M., "Estimating, Costing, Specification & Valuation in Civil Engineering including Computer Estimation", M. Chakraborti Publications (24th Edition). 2010.

Reference Books

1.	Standard specifications volumes I & II (PWD Maharashtra) Government of Maharashtra (GoM).
2.	CPWD specifications.
3.	CPWD schedules of rates.
4.	PWD hand book, red book and standard schedule of rates.
5.	National Building Code of India – Guidelines for regulating the building construction activities.
6.	RERA.

Useful Links	
1.	NPTEL Course – Civil Engineering – Construction Planning and Management – Arbind Kumar Singh, IIT Guwahati – https://nptel.ac.in/courses/105/103/105103093/
2.	NPTEL Course – Civil Engineering – NOC:Principles of Construction Management – Sudhir Misra, IIT Kanpur – https://nptel.ac.in/courses/105/104/105104161/

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	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	2	2	2	10
Understand	2	2	2	10
Apply	3	3	2	10
Analyse	4	4	2	15
Evaluate	4	4	2	15
Create	0	0	0	0
TOTAL	15	15	10	60

Government College of Engineering, Karad

Third Year (Sem – VI) B. Tech. Civil Engineering

CE 2606: Environmental Engineering

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

Course Outcomes (CO)

1.	paraphrase environmental concepts associated with water - its treatment, wastewater - its treatment and solid waste - its management.
2.	illustrate the knowledge of pollution control technologies, to solve the problems in water treatment, wastewater treatment and solid waste.
3.	assess and design water treatment units and wastewater treatment units.

	Course Contents	Hours
Unit 1	**Water** Sources of water, quantity & quality of sources, intake works and their types, water quality parameters and significance in water treatment, water quality standards, water demand for domestic purpose and other various demands, factors affecting demand, fluctuations in demand, rate of water consumption, design period & population forecast, components of water supply system.	**(06)**
Unit 2	**Water Treatment – I** Concept of water treatment, flow diagram of conventional water treatment plant; **Aeration**: purpose, types of aerators, design of cascade aerator. **Coagulation**: Theory, coagulants, types of dosing of coagulants, selection of coagulants, jar tests, design of flash mixer. **Flocculation**: Theory, factors affecting, design of mechanical flocculator. **Sedimentation**: Theory, types of settling, types of sedimentation tanks, design principles & design of settling tank, surface over flow rate, detention period, and concept of tube and plate settler.	**(08)**
Unit 3	**Water Treatment – II** **Filtration**: Objectives, filter media, types of filters - slow sand filter, rapid sand filter, number of filter units, rate of filtration, under - drainage system, design of rapid and slow sand filters, design of under-drainage system, pressure filters. **Disinfection**: Objectives, factors affecting disinfection, methods of disinfection, chemistry of chlorination, types of chlorination, break point chlorination. **Water softening processes:** lime-soda process, ion exchange, effect of fluoride, fluoridation, de-fluoridation.	**(08)**
Unit 4	**Sewage** Domestic and storm water, DWF and WWF, quantity of sewage, sewage flow variations, characteristics of sewage, self – purification, DO sag curve, Streeter – Phelps equation, effluents standards for stream and land disposal, conveyance of sewage – sewers, shapes, design parameters, operation and maintenance of sewers, sewage pumping; sewerage, sewer appurtenances, design of sewerage systems.	**(06)**
Unit 5	**Sewage Treatment** Introduction to sewage treatment plant, detailed study of sewage treatment units (primary treatment – screening, grit removal, oil and grease trap, primary settling tank, secondary treatment – aerobic and anaerobic treatment systems – suspended and attached growth systems and secondary settling tank), sludge characteristics, low cost wastewater treatment methods - septic tank, waste stabilization pond, oxidation pond, lagoons.	**(06)**
Unit 6	**Solid Waste Management** Municipal solid waste, composition and various chemical and physical parameters of MSW, MSW management: collection, transport, treatment and disposal of MSW, effects of solid waste on environment, integrated solid waste management, introduction to hazardous waste and its management.	**(06)**

Text Books	
1.	Dr. Punmia B. C, Er. Jain A. K. and Dr. Jain A. K., "Environmental Engineering I, Water Supply Engineering" by Laxmi Publications Pvt. Ltd. , New Delhi
2.	Dr. Punmia B. C and Er. Jain A. K., "Environmental Engineering II, Wastewater Engineering (Including Air Pollution)" by Laxmi Publications Pvt. Ltd. , New Delhi
3.	Garg S. K., "Water Supply Engineering", Khanna Publishers, New Delhi
4.	Garg S. K., "Sewage Disposal and Air Pollution Engineering", Khanna Publishers, New Delhi
Reference Books	
1.	MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.
2.	Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw - Hill International Editions, New York.
3.	Introduction to Environmental Engineering by M. L. Davis and Davis A. Cornwell (5th edition 2012), McGraw Hill
4.	Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
5.	Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.
6.	Manual on Municipal Solid Waste Management, Ministry of Urban Development, Govt. of India. (2016) Part I, II and III.
Useful Links	
1.	NPTEL Course – Civil Engineering – **Water Supply Engineering** – By Prof. Manoj Kumar Tiwari, IIT Kharagpur – https://nptel.ac.in/courses/105/105/105105201/
2.	NPTEL Course – Civil Engineering – **Wastewater Management** – By Prof. M. M. Ghangrekar, IIT Kharagpur – https://nptel.ac.in/courses/105/105/105105048/
3.	NPTEL Course – Civil Engineering – **Municipal Solid Waste Management** – By Prof. T.V. Ramachandra, IISc Banglore – https://nptel.ac.in/courses/120/108/120108005/

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	3	1	-	2	-	1	3	3
CO 2	2	2	1	2	2	2	3	1	1	-	-	1	3	3
CO 3	2	2	3	2	-	-	1	-	1	-	1	2	3	3
AVG	**2**	**1.66**	**2**	**2**	**1.5**	**2**	**2.33**	**1**	**1**	**2**	**1**	**1.33**	**3**	**3**

Assessment Pattern

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

Third Year (Semester – VI) B. Tech. Civil Engineering

CE2607 : Structural design and drawing I Lab

Laboratory Scheme			Examination Scheme	
Practical	2 Hrs/ Week		**CA**	**25**
Total Credits	1		**ESE**	**25**

Course Outcomes (CO)

Students will be able to:

1.	apply various loads on steel structures as per IS 800: 2007 and IS 875: 1987.
2.	apply different methods of analysis to work out reactive forces in structure.
3.	design structural components of buildings according to the response of structures.
4.	prepare working drawing and detailing using advanced tools and techniques.

Course Contents

Experiment 1	Design of industrial/commercial building including roof truss, purlin, bracings, gantry girder, column, column base and connections.
Experiment 2	Design of any one of the followings: 1. Design of welded plate girder, design of cross section, curtailment of flange plates, stiffeners and connections, simple sketches of lattice girder, one full imperial size drawing sheet. 2. Design of building including primary and secondary beams, column, column base and connections, one full imperial size drawing sheet. 3. Design of Foot Bridge: influence lines, cross beam, main truss, raker joint details, support details.
Requirement Tools	Any structural software like ETAB, STAAD. Pro etc.

Note

ESE shall be based on performance (15 Marks) and oral (10 Marks)

List of Submission:

1. Analysis and design shall be compared with the results of any standard software package.
2. The design shall be as per IS: 800 – 2007 by limit state method.
3. Minimum two drawing sheets shall be drawn manually and other drawing sheets shall be drawn by using any drafting 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	2	3	3	2	2	1	1	1	3	2	2	2	2	2
CO 2	2	3	2	2	2	1	1	2	3	1	1	2	2	2
CO 3	2	2	3	2	2	1	1	2	3	1	1	2	2	2

Assessment Pattern:

For individual student, every experiment will be assessed as per following criteria and average marks will be awarded to the student.

Task I	Proactive Attentiveness: Punctual in attending laboratory sessions/ Field visits	**05 Marks**
Task II	Core Competency: Performance/ Teamwork/ Learning Attitude	**10 Marks**
Task III	Submission/ Neatness/ Writing Skills/ Analysis and Interpretation	**10 Marks**

Skill Level (as per Continuous Assessment Sheet)	**Exp 1**	**Exp 2**	**AVG**
Task I	05	05	05
Task II	10	10	10
Task III	10	10	10
CA	**25**	**25**	**25**

Government College of Engineering, Karad

Third Year (Semester – VI) B. Tech. Civil Engineering

CE2608 : Quantity Surveying and Valuation Lab

Laboratory Scheme			**Examination Scheme**	
Practical	2 Hrs/ Week		**CA**	**25**
Total Credits	1		**ESE**	**25**

Course Outcomes (CO)

Students will be able to:

1.	prepare quantity estimates for buildings and other civil engineering works.
2.	calculate the quantity of materials and carry out rate analysis.
3.	prepare tender document of construction projects.
4.	carry out valuation of immovable properties and rent fixation.

Course Contents

Assignment 1	Writing detailed specifications for items of work from various civil, engineering works. (each from buildings, roads, irrigation works, water supply and sanitation and sewer from buildings)
Assignment 2	Study of different methods of approximate estimate and carry out approximate estimate for building.
Assignment 3	Detailed rate analysis for items of work from various civil engineering works. (at least 10 items).
Assignment 4	Preparation of schedule of reinforcement for RCC work: beams and slabs.
Assignment 4	Preparation of schedule of reinforcement for RCC work: column and footing.
Assignment 5	Preparation of schedule of reinforcement for RCC work: staircase.
Assignment 6	Preparing detailed estimate for G + 1 building with framed structure.
Assignment 7	Preparing detailed estimate for civil structures other than building such as culvert, road, embankment, drainage system (any two).
Assignment 8	Preparing tender notice and schedule ‘B’ (BOQ) for G + 1 building for which the detailed estimate is prepared. Preparing tender document for G + 1 building for which the detailed estimate is prepared.
Assignment 9	Carrying out valuation and preparing detailed valuation report for residential/ commercial/ industrial buildings using standard format.

List of Submission:

Student should submit the assignment based on each topic mentioned above

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	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:

For individual student, every experiment will be assessed as per following criteria and average marks will be awarded to the student.

Task I	Proactive Attentiveness: Punctual in attending laboratory sessions/ Field visits	**05 Marks**
Task II	Core Competency: Performance/ Teamwork/ Learning Attitude	**10 Marks**
Task III	Submission/ Neatness/ Writing Skills/ Analysis and Interpretation	**10 Marks**

Skill Level (as per Continuous Assessment Sheet)	Assgn 1	Assgn 2	Assgn 3	Assgn 4	Assgn 5	Assgn 6	Assgn 7	Assgn 8	Assgn 9	AVG
Task I	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05
CA	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**

Government College of Engineering, Karad

Third Year (Sem – VI) B. Tech. Civil Engineering

CE 2609 : Environmental Engineering Lab

Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		**CA**	25
Total Credits	1		**ESE**	25

Course Outcomes:

Students will be able to:

1	quantify the pollutant concentration in water and wastewater.
2	recommend the degree of treatment required for the water, wastewater and solid waste.
3	articulate concepts related to treatment plant with the exposure of the site visit.

Course Contents

Experiment 1	Study and use of Multi-Parameter for pH, DO, ORP, Conductivity, TDS and Salinity.
Experiment 2	Determination of Acidity and Alkalinity of water and wastewater.
Experiment 3	Determination of Chlorides (Chloride content) and Hardness of water.
Experiment 4	Determination of solids: settable, suspended, dissolved, volatile and fixed solids of water and wastewater.
Experiment 5	Determination of optimum coagulant dose for turbidity removal by using jar test.
Experiment 6	Determination of DO and BOD of wastewater.
Experiment 7	Determination of COD of wastewater.
Experiment 8	Proximate / Ultimate analysis of solid waste.
Experiment 9	Determination of chlorine.
Experiment 10	Prepare a report based on visit to water treatment plant and sewage treatment plant.
Requirement Tools :	

Note:

1. Any 08 (Eight) Experiments from Experiment No. 1 to Experiment No. 9
2. Experiment No. 10 is compulsory.
3. Refer IS 10500:2012 for drinking water standards.
4. Refer IS 4764: 1973, IS 2490:1974, IS 3306:1974 for wastewater parameters.

List of Submission:

1. Write-ups of specified Experiments in standard formats.
2. Visit report with details and layout of Water and Wastewater Treatment Plant.

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
CO1	-	1	-	-	1	2	3	1	-	2	-	1	2	2
CO2	2	2	1	2	2	2	3	1	1	-	-	1	2	2
CO3	2	2	3	2	-	-	1	-	1	-	1	2	2	2

Assessment Pattern (Internal):

For individual student, every experiment will be assessed as per following criteria and average marks will be awarded to the student.

Task I	Proactive Attentiveness: Punctual in attending laboratory sessions/ Field visits	**05 Marks**
Task II	Core Competency: Performance/ Teamwork/ Learning Attitude	**10 Marks**
Task III	Submission/ Neatness/ Writing Skills/ Analysis and Interpretation	**10 Marks**

Skill Level (as per Continuous Assessment 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	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**	**25**

Government College of Engineering, Karad

Third Year (Semester – VI) B. Tech. Civil Engineering

CE2610 : Technical Presentation

Teaching Scheme			Examination Scheme	
Tutorials	1 Hrs/ Week		**CA**	50
Total Credits	1			

Course Outcomes (CO)

Students will be able to:

1.	develop technical report writing skills.
2.	develop technical presentation skills using latest technical resources.

Course Contents

Submission of technical report including individual presentation based on topic by studying following :

Writing skills: Technical writing - basic principles, words – phrases – sentences, construction of cohesive paragraphs, elements of style.

Principles of summarizing: abstract, summary, synopsis.

Technical reports: salient features, types of reports, structure of reports, data collection, use of graphic aids, drafting and writing.

Writing research papers: basic guidelines, documentation, introduction of standard formats such as IEEE, ASCE, Springer Publications, IEI etc.

Presentation skills: speaking skills, accuracy vs. fluency, the audience, pronunciation guidelines, voice control

Professional Presentations: planning, preparing, presentation strategies, overcoming communication barriers, using technology, effective presentations.

Report Format:

Project report should be of 15 to 20 pages (typed on A4 size sheets).

For standardization of the project reports the following format should be strictly followed.

Page Size: Trimmed A4

Top Margin: 1.00 Inch; **Bottom Margin:** 1.32 Inches; **Left Margin:** 1.5 Inches; **Right Margin:** 1.0 Inch

Para Text: Times New Roman 12 Point Font; **Line Spacing:** 1.5 Lines

Headings: Times New Roman, 14 Point Bold Face

Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman

Certificate: All students should attach standard format of Certificate as described by the department. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal, GCE Karad.

Index of Report:

a. Title Sheet
b. Certificate
c. Acknowledgement
d. Table of Contents
e. List of Figures
f. List of Tables

Tutorials

- Periodic presentation during a semester based on topic
- Guest lecture based on above syllabus

Text Books

1.	Kumar, Sanjay and Pushp Lata, “Communication Skills”, Oxford University Press. 2011.
2.	Quirk and Randolph, “A University Grammar of English”, Pearson. 2006.
3.	Rutherford and Andrea J., “Basic Communication Skills for Technology”, Pearson. 2007.

Reference Books

1.	Rizvi, Ashraf M., “Effective Technical Communication”, McGraw Hill. 2009.
2.	Leigh, Andrew and Maynard, Michael, “The Perfect Presentation”, Random House.
3.	Barker, Larry L., “Communication”, Prentice-Hall.
4.	Lesikar and Flatley, “Basic Business Communication-Skills For Empowering the Internet Generation”, Tata McGraw Hill.
5	Micheal Alley, “Craft of scientific writing”, Springer Publications.

Useful Links

1.	NPTEL Course – General – Introduction to Research – Prathap Haridoss, IIT Madras – https://nptel.ac.in/courses/121/106/121106007/

Mapping of COs and POs

PO → CO ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3	3	3	3	2	2	3	2	2	2	3
CO2	1	1	1	2	2	2	2	2	3	3	3	2	1	3

Assessment Pattern:

Skill Level	CA
Critical thinking	10
Communication skills	10
Report Writing	15
Presentation Skill	15
TOTAL	**50**