



**JAIDEV EDUCATION SOCIETY'S
J D COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR**

Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere

Website: www.jdcoem.ac.in E-mail: info@jdcoem.ac.in

An Autonomous Institute, with NAAC "A" Grade

Affiliated to DBATU, RTMNU, MSBTE, Mumbai

Department of Civil Engineering

Building Better Development



Program: B. Tech in Civil Engineering

VII Semester												
Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit	
				L	T	P	CA	MSE	ESE/Ext. Pra.	Total		
1	PCC	CE7T001	Engineering Economics, Estimating and Costing	3	0	0	20	20	60	100	3	
2	PEC	CE7TE01	Professional Elective III	2	1	-	20	20	60	100	3	
3	PEC	CE7TE02	Professional Elective IV	2	1	-	20	20	60	100	3	
4	PEC	CE7TE03	Professional Elective V	3	0	-	20	20	60	100	3	
5	OEC	CEOEC3	Open Elective-III	4	0	-	20	20	60	100	4	
6	PCC	CE7L001	Engineering Economics, Estimation and Costing Lab	0	0	2	60	0	40	100	1	
7	PROJECT	CE7P002	Project-1	0	0	6	75	0	75	150	5	
8	MC	CE7T002	IPR (Intellectual Property Rights)	2	0	0	10	15	25	50	AU	
				16	2	8					22	
Professional Elective III												
1	PEC	CE7TE01A	Traffic Engineering									
2	PEC	CE7TE01B	Contract Management									
3	PEC	CE7TE01C	Waste Water Management									
4	PEC	CE7TE01D	Advanced Construction Material									
5	PEC	CE7TE01F	Bridge Engineering									
Professional Elective IV												
1	PEC	CE7TE02A	Highway Soil Mechanics									
2	PEC	CE7TE02B	Sustainable Construction Engineering									
3	PEC	CE7TE02C	Solid and Hazardous Waste Management									
4	PEC	CE7TE02E	Rock Mechanics									
5	PEC	CE7TE02F	River Engineering									

Professional Elective V

1	PEC	CE7TE03A	Dock, Harbour and Tunnel Engineering
2	PEC	CE7TE03B	Construction Methods and Equipment Management
3	PEC	CE7TE03C	Environmental Impact Assessment and Life Cycle Analysis
4	PEC	CE7TE03D	Advanced Design of Concrete Structures
5	PEC	CE7TE03E	Environmental Geo-technology
Open Elective-III			
1	OEC	CEOEC3A	Smart City
2	OEC	CEOEC3B	Robotics in Civil Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7T001	Engineering Economics, Estimating, Costing	3	0	0	3

Prerequisites for the course	
1	Types of Building and construction units
2	Component of Building and their types
3	Types of Masonry

Prior Reading Material/useful links	
1.	https://theconstructor.org/building/types-masonry-foundations-construction-uses/18989/
2.	https://civiljungle.com/building-components/
3.	https://architectureideas.info/2013/07/stair-shapes/

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Acquaint with various economic financial aspects construction industry and provisions in estimate.
2	CO2	Explain the aspects involved in engineering economics and its relevance in estimating and costing.
3	CO3	Categorize different methods adapted for estimates of different civil engineering works.
4	CO4	Apply the knowledge of estimating in rate analysis for costing of works.
5	CO5	Estimate quantities of different item of work for rate analysis.
6	CO6	Develop the detailed estimate of valuation various civil engineering works, along with its rate analysis.

Syllabus:

Course Content	
Unit I	Engineering Economics: Importance of Construction and Infrastructure in Economic Development and Growth. Sources of Finance for Construction Industry, Concepts of Time Value of Money, Discounted Cash Flow, Internal Rate of Return, Numerical Problem Based on Calculation Of IRR. Affordable Housing Scheme by Government of India.[08hrs]
Unit II	Introduction to Estimating: Purpose of Estimating & Costing. Administrative Approval & Technical Sanction. Types of Estimating. Checklist of Item of Work. Modes of Measurement, Rules for Deduction as per IS 1200. Specifications of Items of Work, Types of Specification. Numerical on Approximate Estimates. [08hrs]
Unit III	Detailed Estimate: Methods of Detailed Estimate, Provisions in Detailed Estimate: Contingencies, Work Charge Establishment Percentage Charges Etc. Detailed Estimates of Load Bearing and Framed Structures. Calculation of Reinforcing Steel with Bar Bending Schedule. Estimate for Civil Engineering Works: Methods of Calculating Earthwork. Estimates of Roads & Canals. Irrigation Works: Estimates of Permanent Land, Temporary Land. [08hrs]
Unit IV	Rate Analysis: Introduction, Purpose and Principles of CSR, Factors Affecting Analysis of Rates, Current Market Rates of Materials and Labour, Rate Analysis of Different Items of Work. [08hrs]
Unit V	Valuation: Purpose of Valuation, Factors Affecting Property Price and Cost, Types of Value. Different Types of Lease, Sinking Fund, Depreciation, and Its Methods, Capitalized Value, Methods of Valuation, Net & Gross Income And Rent Fixation. [08hrs]

Text Books:	
1	Dutta B. N. (2012) "Estimating and Costing", UBS Publishers Distributors, New Delhi
2	Rangwala S. C. (1990), "Elements of Estimating and Costing", Charotar Publication, Anand
3	Birdi G. S. (2014) "Estimating and Costing", DhanpatRai& Sons, N. Delhi
4	Tarquin, A.J and Blank L.T, (1976) Engineering economy and behavioral approach. McGraw Hill Company.
5	Taylor, G.A. (1968). Managerial and Engineering Economy. East-West Edition.
Reference Book:	
1	Govt. of Maharashtra P.W. and Housing Department Publication edition 1979 and 1981
2	P. W. D. Maharashtra, "Standard Specifications", Volumes I & II
3	C.P.W.D. Specifications
4	C.P.W.D. Schedule of Rates
5	P.W.D. Maharashtra Schedule of Rates
6	Publications of Bureau of Indian Standards: IS 1200 all parts, and other relevant.
Useful links	
1	https://www.digimat.in/nptel/courses/video/105104161/L08.html
2	https://www.studypool.com/documents/15282339/estimation-and-costing
3	https://www.erforum.net/2020/05/estimation-costing-handwritten-note-pdf-download.html

Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1.	Dr. Kshitija Kadam	Professor	GCOE, Nagpur
2.	Dr. Prashant Pawade	Professor	GHRCOE
3.	Prof. Shahrukh Kureshi	Assistant Professor	JDCOEM, Nagpur
4.	Prof. Shital Navghare	Assistant Professor	JDCOEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE01A	Traffic Engineering	2	1	0	3

Prerequisites for the course	
1.	Knowledge of basic physics, including motion, force, and energy.
2.	Traffic engineering principles, including traffic flow theory and capacity analysis.
3.	Knowledge of road design and construction, including geometric design principles and standards
4.	Awareness of traffic safety issues and regulations.

Prior Reading Material/useful link	
1.	https://www.pbs.org/video/science-trek-force-and-motion/
2.	https://www.youtube.com/watch?v=nzeHzzqFIYk
3.	https://www.civil.iitb.ac.in/~vmtom/nptel/301_IntroGD/web/web.html
4.	https://indiancc.mygov.in/wp-content/uploads/2021/06/mygov-99999999803618977.pdf

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Acquire the knowledge of traffic survey, road geometry, traffic safety and Intelligent Transportation System.
2	CO2	Understand the survey methods, traffic controlling devices, traffic management, and modern techniques for transportation system.
3	CO3	Apply the knowledge of geometric and safety parameters, establishing the comparison between traditional and modern intelligent transportation systems.
4	CO4	Examine the road geometry, traffic surveys, its safety measures and working of Intelligent Transportation System.
5	CO5	Explain the various parameters involved in traffic engineering and modern techniques in traffic engineering.
6	CO6	Design the traffic management system.

Syllabus:

Course Content	
Unit I	General: Road, road user & road vehicle characteristics, traffic on Indian roads. Traffic Surveys: speed, journey time and delay studies, methods of measurement of spot speed, headways gaps, measurements of running and journey speeds, origin and destination surveys, survey methods, sample size, data analysis & presentation, highway capacity, level of service [10 hrs]
Unit II	Road geometry: Hierarchy of urban roads and their standards, diverging, merging, crossing, weaving, maneuvers and conflict points, types of road junction, channelization of traffic flow, traffic rotary design, grade separated intersections, drive ways. Traffic controlling devices: Traffic signs, road markings, traffic signals, design of signalized intersections & signaling systems, Queuing theory. [8 hrs]
Unit III	Traffic Safety: Driver's error, vehicle & road surface laws and enforcement, traffic accident conditions in India, collection and interpretation of accident data and recording in standard Format, skidding, speed and weather effects on accidents, analysis of accidents, pedestrian, cyclist & auto vehicle driver's safety, traffic regulation, 3E's of traffic management. [10 hrs]
Unit IV	Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection. [10 hrs]
Unit V	Importance of telecommunications in the ITS system, Information Management, Traffic Management Centers (TMC). Vehicle – Roadside communication – Vehicle Positioning System. ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS). [10 hrs]

Text Books:

1	Highway Engineering: (1991) Khanna S.K. and Justo C.E.G., Nem Chand & Bros.
2	Traffic Engineering and Transportation Planning: (1987) Kadiyali, Khanna Publications.

Reference Book:

1	Transport planning and Traffic Engineering, edition Latest, C A O'Flaherty, Butterworth Heinemann Publications.
2	Introduction to Transportation Engineering, edition Latest, James H Bank, Tata Mcgraw-Hill Publications.
3	Transportation Engineering an Introduction, edition C. Jotin Khisty, PHI Publication.

Useful Links:

1	Traffic Surveys: https://nptel.ac.in/courses/105101008
2	Road geometry: https://archive.nptel.ac.in/courses/105/107/105107220/

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Sr. No.	Name of Person	Designation	Organization
1.	Dr. Kshitija Kadam	Professor	GCOE, Nagpur
2.	Dr. Prashant Pawade	Professor	GHRCOE
3.	Dr. Rahul Ralegaonkar	Professor	VNIT, Nagpur
4.	Ms. Shital Navghare	Assistant Professor	JDCOEM, Nagpur
5.	Mr. Gaurav Rangari	Assistant Professor	JDCOEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE01B	Contract Management	2	1	0	3

Prerequisites for the course	
1.	Basics of Contract Law
2.	Indian Contract Act 1872
3.	Risk Management in Construction
4.	Basics of Dispute Resolution

Prior Reading Material/useful link	
1	https://www.youtube.com/watch?v=xF-FkvmnXck
2	https://www.youtube.com/watch?v=oEO5IrFv7ts
3	https://www.youtube.com/watch?v=IBL9MqvpPIM
4	https://www.youtube.com/watch?v=PpDngLCiTHo

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Define various contracts, their suitability and the procurement process involved in construction projects.
2	CO2	Explain the need of understanding and reviewing various provisions included in the contract for effective management of the projects
3	CO3	Apply legal aspects of construction projects, of construction contract, of issues related to contract administration.
4	CO4	Analyze various contract management processes involved in construction projects disputes resolution techniques.
5	CO5	Evaluate various criteria, parameters, laws, contract documents and dispute resolution methods leading to a valid contract document
6	CO6	Create construction contract documents satisfying the indispensable clauses and conditions.

Syllabus:

Course Content	
Unit I	Construction Contract: Agreement, Contract, essential conditions, Indian Contract Act 1872, types of contracts, terminology of contract. Construction Specifications: Standard specifications, general specification, development, interpretation. [6 hrs]
Unit II	Tender and tender documents: Definitions, List of Documents, EMD, Security Deposit, Invitation for Tenders and sale of Documents, Preparation of Tender Documents and its submission, Receipt of Tender Documents and its opening, Evaluation of Tender and Award of contract–Letter of Award, Letter of Intent, Issues in tendering process. [8 hrs]
Unit III	Administration/Performance of contract: Responsibilities of Principal & Contractor, Monitoring and Quality control/assurance, Settlement of claims – Advances, Bills, Extension for time, Extras & Variations, Cost Escalations. Security Deposit, Retention Money, Performance Bond, Liquidated Damages, Penalties, Statutory Requirements. Breach of contract: Definition and Classification, Common Breaches by – Principal, Contractor, Damage Assessment, Claims for Damages. [8 hrs]
Unit IV	Dispute Resolution Mechanism: General, Methods for dispute resolution–Negotiations, Mediation, Conciliation, Dispute Resolution Boards, Arbitration, Litigation/Adjudication by courts. Conciliation – Appointment of Conciliator, Role of Conciliator, Special Features of Conciliation Dispute Resolution Boards (DRB), Constitution of DRB, Functioning of DRB, Procedure for Hearings, Status of Award. [8 hrs]
Unit V	Contract document: Drafting of clauses, development, and interpretation, CPWD conditions of contract, FIDIC conditions of contract. BOT contract: PPP framework, types of risk, concession agreement, drafting of clauses, development, and interpretation. Laws affecting Engineers: Labour Law, Sales Tax, VAT, Service Tax, Excise Duty Relational Contract: Partnering, alliancing, key elements, processes. [6 hrs]

Text Books:

1	L.S. RanagaRao Contract Management and Dispute Resolutions Engineering staff College of India January 2008.
2	C. J. Schexnayder and R. E. Mayo, Construction Management Fundamentals, McGraw Hill, New Delhi. 2003.
3	General Conditions of Contract, Central Public Works Department, New Delhi, 2010.

Reference Book:

1	D.S. Berrie and B.c. Paulson, Professional construction management including C.M., Design construct and general contracting, McGraw Hill International, Third Edition 1992.
2	V. K. Raina, Construction & Contract Management Practices, SPD, New Delhi

Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1.	Dr. Anant Pande	Professor	YCCE, Nagpur
2.	Dr. Prashant Pawade	Professor	GHRCOE, Nagpur
3.	Dr. Kshitija Kadam	Professor	GCOE, Nagpur
4.	Mr. Kamlesh Meshram	Assistant Professor	JDCEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE01C	Waste Water Management	2	1	0	3

Prerequisites for the course	
1.	Water quality parameters, including pH, dissolved oxygen, and nutrient concentrations.
2.	Basic understanding of fluid mechanics and hydraulic principles.
3.	Knowledge of environmental regulations related to wastewater treatment and disposal.
4.	Understanding of health and safety considerations in wastewater treatment operations.

Prior Reading Material/useful link	
1.	https://www.intechopen.com/chapters/69568
2.	https://www.youtube.com/watch?v=MZ6GCH2nLy0
3.	https://www.youtube.com/watch?v=yfvwaT6jgdc
4.	https://www.youtube.com/watch?v=9Zvz2gniyYY

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Recall the various treatment processes on the waste and sludge.
2	CO2	Explain the wastewater quantity along with it's treatment process.
3	CO3	Apply the knowledge of waste water and sludge to treat at various stages.
4	CO4	Distinguish the various stages in waste water and sludge treatment.
5	CO5	Justify the quality of treated waste water and sludge.
6	CO6	Design the waste water and sludge treatment units.

Syllabus:

Course Content	
Unit I	Introduction, Quantity & Quality of Wastewater: Components of Wastewater Flows, Wastewater Sources & Flow rate, variations in Flow rates & Strength, Characteristics of wastewater, quantity of wastewater. [6 hrs]
Unit II	Primary Treatment of Wastewater: Physical Unit Operations- Screening, Grit Removal, Oil & Grease Removal, Primary Sedimentation. [6 hrs]
Unit III	Secondary Treatment of Wastewater: Fundamentals of Biological Treatment, Microbial Metabolism, Bacterial Growth, Suspended & Attached Growth Processes, Activated Sludge Process & its Modifications, Trickling Filters, Secondary Clarification, Aerated Lagoons, Oxidation Ditch. [6 hrs]
Unit IV	Anaerobic Treatment of Wastewater Anaerobic Suspended & Attached Growth Processes, Factors affecting Anaerobic Processes, Anaerobic Lagoons, UASB, Septic Tank, Anaerobic Baffled Reactor [6 hrs]
Unit V	Sludge Treatment Solid Sources, Characteristics & Quantities, Sludge Pumping, Introduction to mass balance approach, Treatment-Thickening, Stabilization, Design of Sludge Digester, Conditioning, Dewatering, Drying [4 hrs]

Text Books:	
1	Manual on sewerage and sewage Treatment-Government of India Publication
2	Masters G.M., "Introduction to Environmental Engineering and Science"
3	Metcalf & Eddy, "Waste Water Engineering Treatment & Disposal", Tata McGraw Hill, 1982
Reference Book:	
1	Garg S.K., "Sewage Disposal and Air Pollution Engineering", Khanna Publishers
2	Rao M.N. & Datta, Waste water treatment
3	Ehalers Victor & Earnest W Steel, Municipal and Rural sanitation

Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1.	Dr. Prashant Pawade	Professor	GHRCOE, Nagpur
2.	Dr. Kshitija Kadam	Professor	GCOE, Nagpur
3.	Mr. Nilesh Pal	Assistant professor	JDCOEM, Nagpur
4.	Mr. Gaurav Rangari	Assistant professor	JDCOEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE01D	Advanced Construction Material	2	1	0	3

Prerequisites for the course	
1.	Chemistry and physics, including materials science, mechanics, and thermodynamics.
2.	Types of concrete, including Portland cement concrete and lime concrete.
3.	Manufacturing process and properties of different types of cement, including ordinary Portland cement and pozzolana cement.
4.	Different types of admixtures used in concrete and their effects on the properties and behavior of the material.

Prior Reading Material/useful link	
1.	https://theconstructor.org/concrete/types-concrete-admixtures/5558/
2.	https://www.amazon.in/Thermodynamics-Physicists-Materials-Scientists-Undergraduate-ebook/dp/B0B653ZQG1
3.	https://civiltoday.com/civil-engineering-materials/cement/250-types-of-cement

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	List the various advanced construction materials.
2	CO2	Classify the construction materials based on different modes.
3	CO3	Utilize the various construction materials for an advancement in construction industry.
4	CO4	Analyze the quality and requirement of materials for specific structural purpose.
5	CO5	Decide application of material as per the requirement of desired structural construction.
6	CO6	Adopt the advanced material for modernization of construction Work.

Syllabus:

Course Content	
Unit I	Construction Materials: Classifications of Construction Materials. Consideration of physical, Mechanical, thermo-physical Properties, characteristics behaviour under stress, selection criteria for construction materials, green building materials, waste products, reuse and recycling [8 hrs]
Unit II	Materials for making Mortar and concrete: Lime manufacture, properties, hardening of lime, types of lime, lime concrete uses, cement, aggregates, water, characteristics, properties and uses of Pozzolana materials, Types of mortars, special mortars, properties and applications, admixtures [8 hrs]
Unit III	Ceramic Materials: Classification, Refractories, glass, glass wool, mechanical, thermal and electrical properties, fire resistance materials, Uses and application. Polymeric Materials: Polymerization mechanism and depolymerisation. Rubber and plastics, properties, effect of temperature on mechanical properties. Uses and application. [8 hrs]
Unit IV	Types of structural steels, special steel, alloy steel, stainless steel, light gauge steel, Corrosion of concrete in various environments. Corrosion of reinforcing steel. Electro-chemical process, measures of protection. Ferro-cement, material and properties. Polymers in Civil Engineering Polymers, fibres and composites, Fibre reinforced plastic in sandwich panels, modeling. [8 hrs]
Unit V	Architectural use and aesthetics of composites. Adhesives and sealants. Structural elastomeric bearings and resilient seating. Moisture barriers, Polymer foams and polymers in Building Physics. Polymer concrete composites. [8 hrs]

Text Books:	
1	Rangawala S.C. Engineering Materials Chortor Publications 1991.
2	S.K. Duggal, Building Materials, New Age International Publications 2006.
Reference Book:	
1	Bruntley L.R Building Materials Technology Structural Performance & Environmental Impact McGraw Hill Inc 1995.
2	R. Chudley, Construction Technology, Vol I - IV Longman Group Construction Ltd. 1973

Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1.	Dr. Rahul Ralegaonkar	Professor	VNIT, Nagpur
2.	Mrs. Atika Ingole	Assistant Professor	JDCOEM, Nagpur
3.	Mr. Atul Gautam	Assistant Professor	JDCOEM, Nagpur
4.	Mr. Parag Pal	Alumni	SAI Consulting Engineers PVT. Ltd, Bangalore

Semester	Course Code	Name of Course	L	T	P	Credits
	CE7TE01F	Bridge Engineering	2	1	0	3

Prerequisites for the course	
1.	Foundations and substructures of bridges.
2.	Different types of bridges, including their classifications, types of materials used, and factors to consider in their design.
3.	Different types of loads that bridges are subjected to, including dead loads, live loads, and impact effects, as well as the various design codes and standards that regulate them.

Prior Reading Material/useful link	
1.	https://archive.nptel.ac.in/courses/105/105/105105216/
2.	https://archive.nptel.ac.in/courses/105/105/105105216/
3.	https://archive.nptel.ac.in/courses/105/105/105105165/

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Define the bridges, its components and specifications for analysis and design.
2	CO2	Interpret the design procedure for bridge components under various classifications.
3	CO3	Develop a bridge structure adapting IS Specifications for different bridge components.
4	CO4	Distinguish between various specifications s provided by IS standards for different components of bridge and its classification.
5	CO5	Recommend the bridge type according to its utility and specification as per the recommendations.
6	CO6	Design the various bridge components according to bridge classifications as per IS Specifications.

Syllabus:

Course Content	
Unit I	Components of Bridges Classification – Importance of Bridges – Investigation for Bridges – Selection of Bridge site – Economical span – Location of piers and abutments – Subsoil exploration – Scour depth – Traffic projection – Choice of bridge type. [8 hrs]
Unit II	IRC Standards Specification of road bridges – width of carriageway – loads to be considered – dead load – IRC standard live load – Impact effect. [6 hrs]
Unit III	General Design Considerations Design of culvert – Foot Bridge - Slab Bridge – T-beam Bridge – Box Culvert-Fly over bridges. [6 hrs]
Unit IV	Bridge sub structure Evaluation of sub structures – Pier and abutments caps – Design of pier – Abutments – Type of foundations. [6 hrs]
Unit V	Bearings for Bridges Importance of Bearings – Bearings for slab bridges – Bearings for girder bridges – Electrometric bearing – Joints – Expansion joints. [6 hrs]

Text Books:	
1	Design of Bridge Structures, T.R. Jagadeesh, Prentice Hall of India Ltd.
2	Theory and Design of Bridges, Petros P. Xanthakos, John Wiley & Sons.
3	Bridge engineering by S. Ponnuswamy, TataMcGraw-Hill, 1986.
Reference Book:	
1	Bridge superstructure by N.Rajagopalan, Narosa Publishing House, 2006.
2	Hydraulic factors in bridge design, R. V. Farraday, F. G. Charlton, Hydraulics Research.

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3.	Mrs. Atika Ingole	Assistant Professor	JDCOEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE02A	Highway Soil Mechanics	2	1	0	3

Prerequisites for the course	
1.	Basic understanding of soil mechanics and geotechnical engineering principles.
2.	Soil properties and behavior, including soil types and classification systems.
3.	Soil sampling methods and exploration techniques.

Prior Reading Material/useful link	
1.	https://www.youtube.com/watch?v=V1m3cB-Aqy8
2.	https://environment.uwe.ac.uk/geocal/SoilMech/classification/default.htm
3.	https://www.slideshare.net/jagadish108/3-sampling

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Define the terminologies involved highways soil mechanics.
2	CO2	Demonstrate soil investigations and various characteristics of soil.
3	CO3	Identify the properties of soil for the highway works.
4	CO4	Examine the soil properties form the testing to know the suitability.
5	CO5	Determine the behavior of soil from different analysis methods and theories.
6	CO6	Plan the highway drainage work from the properties of soil and its analysis.

Syllabus:

Course Content	
Unit I	Site Investigation: Planning and exploration Methods of Sampling, Geophysical methods, SPT, lab and field CBR value, Determination of k value on field. Soil classification systems, HRB classification, Group Index Method. [6 hrs]
Unit II	Shear strength of soil: Introduction, Elastic properties of soil – Tangent, Secant modulus, Poisson's ratio, Shear Modulus, Terzaghi's effective stress principle, effective shear parameters, measurement of pore pressures. [8 hrs]
Unit III	Stability of slopes: Introduction, Types, Different methods of analysis of slopes for $\phi_u = 0$ & $C-\phi$ soil, Location of most critical circle, Stability Analysis of Slopes, Friction circle method, Taylor's stability number. [8 hrs]
Unit IV	Soil Compaction: Theories of compaction, factors affecting compaction, Method of Compaction Laboratory and Field. Compaction Energy of Road. Earth Pressure Theories: Coulomb's Wedge Theory, Culmann's method. Sheet pile walls and their analysis. [8 hrs]
Unit V	Highway Drainage: Importance, Surface drainage, Sub-surface drainage, Design of Surface and subsurface drainage system, Road construction in waterlogged and coastal areas. [5 hrs]

Text Books:	
1	"Foundation Engineering", G A Leonards, McGraw-Hill, Kogakusha, 1962, ISBN : 0750908203
2	"Drainage of Highway and Airfield Pavements" Harry R Cedegren, Wiley; 1 edition, 1974, ISBN-13: 978-0471141815
3	"Highway Engg", S.K. Khanna, C.E.G. Justo, and Veeraragavan A 10th edition. Nem Chand Bros Rookee ISBN 978-81-85240-72-5
Reference Book:	
1	"Soil Mechanics for Road Engineers" – HMSO, London. ISBN 10: 0115502785
2	"Designing with Geosynthetics", Robert M Koerner, 6th edition, Vol 2, ISBN: 9781465345240, 1465345248, 1986
3	Soil Mechanics in Highway Engineering, Rodriguez,A,R, Castillo del.h, Trans Tech Publications
4	Essentials of Soil Mechanics and Foundations, David McCarthy, Pearson Education
5	Basic Soil Mechanics, R. Whitlow, Pearson Education

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4.	Mr. Parag Pal	Alumni	SAI Consulting Engineers PVT.Ltd, Bangalore

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE02B	Sustainable Construction Engineering	2	1	0	3

Prerequisites for the course	
1.	Knowledge of sustainable development principles and practices, including their environmental, economic, and social aspects.
2.	Concept of ecological design and its major contributions to sustainable building.
3.	Sustainable site and landscape design, including stormwater management and heat island mitigation.

Prior Reading Material/useful link	
1.	https://www.youtube.com/watch?v=7V8oFI4GYMY
2.	https://en.wikipedia.org/wiki/Ecological_design
3.	https://www.youtube.com/watch?v=I1iIkV4rOuo

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Define sustainability, its need and strategies for sustainable environment.
2	CO2	Explain the various aspects involved to build sustainable environment.
3	CO3	Organize indoor environment quality considering all the parameters of sustainability.
4	CO4	Examine the environmental aspects to work on the sustainability.
5	CO5	Choose the strategy to maintain sustainability as per the requirement.
6	CO6	Plan the sustainable environment considering the need, strategies, ecological design and environmental quality.

Syllabus:

Course Content	
Unit I	Sustainability in the built environment: sustainable development relative to ecological, economic and social conditions – efforts in sustainable development and construction – international organizations involved. Ethics and sustainability: environmental and resource concerns – resource consumption by construction industry – Green building movement. [6 hrs]
Unit II	Ecological design – concept, major contributions, Building assessment and eco labels standards LEED, GRIHA assessment structure and process. Green building design process – documentation requirements. [6 hrs]
Unit III	Sustainable site and landscape- storm water management, heat island mitigation, assessment of sustainable sites. Building energy issues, building energy design strategy, building envelope – internal load reduction, energy optimization, renewable energy systems. Reducing carbon footprint. Built environment hydrologic cycle, water resources issues [6 hrs]
Unit IV	Strategies for conservation and recycling – waste water and storm water handling strategies. Materials resources – Life cycle assessment – embodied energy – Green building materials and products – assessing for environmental impacts – design for deconstruction – LEED credits for different aspects [6 hrs]
Unit V	Indoor environmental quality – issues and causes components of integrated design, emissions from building materials. Construction operations, site planning, indoor air quality during construction, materials management, Construction and Demolition, waste management – building commissioning – LEED credits for different aspects. Green building economics – quantifying benefits. Recent advances in sustainable construction [6 hrs]

Text Books:	
1	“Sustainable Building Design Manual – Volume II”, Published by TERI, NewDelhi, 2004
2	Kibert, C. J., “Sustainable Construction: Green Building Design and Delivery”, John Wiley & Sons, 2013
3	Steven V. Szokolay., “Introduction to Architectural Science – The Basis of Sustainable Design”, Elsevier, 2007
Reference Book:	
1	Sandy Halliday, “Sustainable Construction”, Routledge, (Taylor & FrancisGroup), 2013
2	DejanMumovic and Mat Santamouris (Ed), “A Handbook of SustainableBuilding Design and Engineering”, Earthscan Publishing, 2009
3	Osman Attmann, “Green Architecture: Advanced Technologies andMaterials”, McGraw Hill, 2010.
Useful Link:	
1.	https://onlinecourses.nptel.ac.in/noc19_ce40/

Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1.	Dr. Anant Pande	Professor	YCCE, Nagpur
2.	Dr. Prashant Pawade	Professor	GHRCOE, Nagpur
3.	Prof. Shahrukh Kureshi	Assistant Professor	JDCOEM, Nagpur
4.	Prof. Shital Navghare	Assistant Professor	JDCOEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE02C	Solid and Hazardous Waste Management	2	1	0	3

Prerequisites for the course	
1.	Basic principles of environmental science and engineering.
2.	Types and characteristics of solid waste.
3.	Knowledge of waste management hierarchy and the principles of reduce, reuse and recycle.

Prior Reading Material/useful link	
1.	https://www.researchgate.net/publication/295980998_Principles_of_Environmental_Sciences
2.	https://prepp.in/news/e-492-types-of-solid-waste-environment-notes
3.	https://www.conserve-energy-future.com/reduce-reuse-recycle.php

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Acquire the knowledge of different types of sources, sampling and characteristics of solid waste.
2	CO2	Explain about municipal solid waste management along with waste collection, its process techniques and its risk assessment.
3	CO3	Identify types of wastes, methods of collection of wastes.
4	CO4	Examine the problems for solid waste disposal to use the various techniques accordingly.
5	CO5	Interpret the waste processes techniques for solid waste management and risk assessment.
6	CO6	Adapt the solid waste management techniques.

Syllabus:

Course Content	
Unit I	Introducing Municipal Solid Waste Management Overview: Problems and Issues of Solid Waste Management – Need for Solid Waste Management-Functional Elements such as Waste Generation, Storage, Collection, Transfer and Transport, Processing, Recovery and Disposal in The Management of Solid Waste [6 hrs]
Unit II	Waste Collection, Storage and Transport Collection and Storage of Municipal Solid Waste; Methods of Collection -House to House Collection - Collection Routes; On Site Storage Methods-Materials used for Containers - Recycling and Reuse of Waste -Need for Transfer and Transport; Transfer Station-Selection of Location, Operation and Maintenance; Transportation Methods-Manual. [6 hrs]
Unit III	Waste Processes Techniques Processing Techniques-Biological and Chemical Conversion Technologies-Composting and Its Methods, Vermi-Composting, Mechanical Composting, In Vessel Composting, Incineration, Pyrolysis, Gasification. [6 hrs]
Unit IV	Hazardous Waste Definition, Sources, Hazardous Characteristics, Management, Treatment and Disposal Electronic Waste Waste Characteristics, Generation, Collection, Transport and Disposal Biomedical Waste Definition, Sources, Classification, Collection, Segregation- Color Coding, Treatment and Disposal. [6 hrs]
Unit V	Quantitative Risk Assessment, Remedial Investigations, Containment and Alternative Analysis. [4 hrs]

Text Books:	
1	Integrated Solid Waste Management: Techobanglous, Thisen and Vigil, McGraw Hill International.
2	Hazardous Waste Management: Lagrega, Buckingham and Evans, McGraw Hill International.
3	Solid Waste Management in Developing Countries: A.D. Bhide, Nagpur publications.
Reference Book:	
1	Environmental Pollution Control Engineering: C.S. Rao, Wiley Eastern, Manual of solid waste of management, CPHEEO.
2	E-Waste: Implications, Regulations, and Management in India and Current Global Best Practices, RakeshJohri, the Energy and Resources Institute.

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1.	Dr. Prashant Pawade	Professor	GHRCOE, Nagpur
2.	Dr. Kshitija Kadam	Professor	GCOE, Nagpur
3.	Mr. Nilesh Pal	Assistant professor	JDCEM, Nagpur
4.	Mr. Gaurav Rangari	Assistant professor	JDCEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE02E	Rock Mechanics	2	1	0	3

Prerequisites for the course	
1.	Basic knowledge of geology and minerals
2.	Knowledge of rock mechanics and their behavior
3.	Basic knowledge of construction techniques and practices in rock

Prior Reading Material/useful link	
1.	https://opengeology.org/textbook/3-minerals/
2.	https://link.springer.com/chapter/10.1007/978-3-540-73295-2_1
3.	https://www.youtube.com/watch?v=FLAM5Yd5PjA

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Recall the various classifications of rocks, it's failure theories, applications in foundation, strengthening processes and its role in tunnel and mining engineering.
2	CO2	Explain the properties of rocks, testing on rocks and their application in foundation, tunnels and mining.
3	CO3	Apply the knowledge to predict type of rock, strength of rock, failure theories with respect to various civil engineering applications.
4	CO4	Examine the various properties of rocks which will help in predicting the strength and behavior of rocks for designing structures in/on rocks masses.
5	CO5	Choose the type if rock foundation according to their classifications, properties, failure theories, strengthening treatments for tunneling operation.
6	CO6	Design the shallow and deep foundation considering the mechanics.

Syllabus:

Course Content	
Unit I	Classification of rocks, geological petro graphic and engineering. Index properties of rocks- porosity, density, permeability, durability and slake. Core recovery, RQD and its importance in engineering Stress-strain behaviour, factors influencing the strength of rock, temperature, confining pressure, strain rates, modes of failures of rocks. [8 hrs]
Unit II	Failure theories of rocks Mohr's hypothesis, Griffith's Criteria, Muller's extension of Griffith's theory, elementary theory of crack propagation, failure of rock by crack propagation, effects of cracks of elastic properties. Testing of rocks: Laboratory and field test, assessment of in-situ strength [8 hrs]
Unit III	Rock Foundation: Shallow and deep investigation for foundation design and construction aspect, slope stability analysis, mode of failures in rock. Design of slopes, excavation in rock and stabilization concepts [8 hrs]
Unit IV	Strengthening of rocks: Foundation treatment for dams and heavy structures by grouting and rock reinforcement. Methods and principles of grouting, principles of design of rock bolts [8 hrs]
Unit V	Tunnels – Basic terminology and application, site investigations, methods of excavation of tunnels supports and stabilization, construction control and maintenance, tunnel ventilation, control of ground water and gas Underground Mining; mining methods, planning and design, mining equipment and mining procedures, cause for subsidence and its remedial measures [8 hrs]

Text Books:	
1	Engineering Rock Mechanics: An Introduction to the Principles by J. A. Hudson and J. P. Harrison
Reference Book:	
1	Rock Mechanics: For Underground Mining by Barry H.G. Brady

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3.	Prof. Shahrukh Kureshi	Assistant Professor	JDCEM, Nagpur
4.	Prof. Shital Navghare	Assistant Professor	JDCEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE02F	River Engineering	2	1	0	3

Prerequisites for the course	
1.	Knowledge of erosion and sedimentation control measures
2.	Understanding of bedforms and their characteristics
3.	Water quality and environmental impact assessment

Prior Reading Material/useful link	
1.	https://archive.nptel.ac.in/courses/105/103/105103204/
2.	http://nitttrc.edu.in/nptel/courses/video/126105012/lec55.pdf
3.	https://archive.nptel.ac.in/courses/103/106/103106159/

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Acquire the knowledge of sediments, river flow, its resistance & total load transport.
2	CO2	Explain sediment problems and flow characteristics in alluvial stream along with bed load mechanism.
3	CO3	Apply bed load equations for channel design carrying sediments with flow regimes.
4	CO4	Analyze total load transport considering sediment properties and flow regimes.
5	CO5	Evaluate the river flow characteristics considering bed load mechanism.
6	CO6	Design of channel carrying sediments.

Syllabus:

Course Content	
Unit I	Origin and properties of sediments: Nature of sediment problems, origin and formation of sediments, properties of sediments, incipient motion of sediment particles, tractive force approach, cohesive materials. [6 hrs]
Unit II	Regimes of flow: Description of regimes of flow, ripple, dune, antidune, prediction of regimes of flow. Resistance to flow & velocity distribution in alluvial streams: velocity distribution in turbulent flow over rough boundaries, resistance and velocity distribution in alluvial streams. [8 hrs]
Unit III	Bed load transport & saltation: Bed load equations, bed load equations based upon dimensional considerations and semi-theoretical equations, general comments on bed load equations, saltation. [6 hrs]
Unit IV	Suspended load transport: Mechanism of suspension, equation of diffusion, sediment distribution equation, relations for suspended load, wash load, transport of suspended sediment. [6 hrs]
Unit V	Total load transport: sediment samplers design of canals carrying sediment laden water Types of sediment samplers Design of channels carrying sediment laden water Sediment transport through pipes. [6 hrs]

Text Books:	
1	Garde R J and RangaRaju K G, Mechanics of Sediment Transportation and Alluvial Stream Problems Wiley Eastern Ltd., 1985.
2	Yang C.T., Sediment Transport- Theory and Practice, The McGraw Hill Companies Inc. 1996.
Reference Book:	
1	Chang H.H., Fluvial Processes in River Engineering John Wiley 1988.
2	Simons D.B. and Senturk F., Sediment Transport Technology, Water Resources Publications, Fort Collins, Colorado 1977.

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2.	Dr. Kshitija Kadam	Professor	GCOE, Nagpur
3.	Mr. Nilesh Pal	Assistant professor	JDCOEM, Nagpur
4.	Mr. Gaurav Rangari	Assistant professor	JDCOEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE03A	Dock, Harbour and Tunnel Engineering	3	0	-	3

Prerequisites for the course	
1	Structural mechanics and material properties
2.	Familiarity with coastal and marine engineering
3.	Understanding of surveying and site planning

Prior Reading Material/useful link	
1.	https://archive.nptel.ac.in/courses/114/106/114106025/
2.	https://archive.nptel.ac.in/courses/105/105/105105212/
3.	https://archive.nptel.ac.in/courses/114/106/114106025/

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Identify various component parts of dock, harbor and tunnel.
2	CO2	Demonstrate the fundamental principles of wave hydrodynamics and port cargo handling.
3	CO3	Develop the convenient mode of transportation for desired condition.
4	CO4	Classify the navigation aids at harbour and application of various shapes of tunnels.
5	CO5	Explain the construction techniques, maintenance and renovation aspects of various modes of transportation.
6	CO6	Elaborate the methods of route alignment geometric design of elements of Harbour and Tunnel structures.

Syllabus:

Course Content	
Unit I	Water Transportation: Advantages and Disadvantages, Modern trends in water transportation. Harbour Planning: Selection of Site, Ship characteristics, Characteristics of good harbour, Size of harbour, Defects in Harbours. Harbour Layout and Terminal Facilities. Natural Phenomena: Tides, Wind, Water waves, Currents phenomena, Characteristics and effects on marine structures, Littoral drift. Wave action on Coastal Structures and Coastal Protection Works – Coastal Regulation Zone, 2011. [8 hrs]
Unit II	Marine Structure: General design aspects, Breakwaters – function, types general design principles, Wharves, Quays, Jetties, Piers, Pier heads, Dolphin, Fenders, Mooring Accessories. [6 hrs]
Unit III	Docks and Repair Facilities: Harbor docks, Wet docks, Repair docks, Lift docks, Floating docks, Slipways. Port: Definition, Port building facilities, Transit sheds, Warehouses, Cargo handling facility, Services for shipping terminals, Inland port facilities planning. [6 hrs]
Unit IV	Tunnel Engineering: Introduction, Shape and Size of Tunnel Shafts, Pilot Tunnels, Tunneling in Hard Rock and Soft Materials, Drilling-Patterns, Blasting, Timbering, Mucking, Tunnel Lining, Advances in Tunneling Methods, Safety Measures, Ventilation, Lighting and Drainage of Tunnels [8hrs]
Unit V	Tunneling Methods: Types and purpose of tunnels; factors affecting choice of excavation technique; Methods – soft ground tunneling, hard rock tunneling, shallow tunneling, deep tunneling; Shallow tunnels – cut and cover, cover and cut, pipe jacking, jacked box excavation techniques, methods of muck disposal, supporting, problems encountered and remedial measures [8 hrs]

Text Books:

1	Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, VScitech Publications (India), Chennai, 2010
2	Harbour, Dock And Tunnel Engineerin, R. Srinivasan, Charoter publishinghouse.
Reference Book:	
1	Ozha&Ozha, “Dock and Harbour Engineering”, 1 st Edition, Charotar Books, Anand., 1990.
2	Venkatramaiah. C., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels., Universities Press (India) Private Limited, Hyderabad, 2015.

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2.	Dr. Kshitija Kadam	Professor	GCOE, Nagpur
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4.	Mr. Gaurav Rangari	Assistant professor	JDCEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE03B	Construction Methods and Equipment Management	3	0	-	3

Prerequisites for the course	
1.	Basic construction materials such as concrete, asphalt, soil, and rock.
2.	Construction processes and techniques.
3.	Safety procedures and regulations in construction.

Prior Reading Material/useful link	
1.	https://www.youtube.com/watch?v=ULt4aEst4mM
2.	https://www.youtube.com/watch?v=2B7DhQvL8kw&list=PLwdnzlV3ogoVGSUhjx4VzW-dGz7DqQFoj
3.	https://www.youtube.com/watch?v=YLH-Ih8omjI

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Acquire the knowledge about standard designations, sizes, and graduations of equipment.
2	CO2	Explain terminology and units of measurements related to equipment usage in industrial, heavy civil and commercial projects.
3	CO3	Solve cost analysis for owning and operating heavy equipment.
4	CO4	Analyze the construction methods and equipment for the proper selection, application, utilization, and productivity of heavy equipment.
5	CO5	Compare the general process/methods for constructing industrial, heavy civil and commercial projects.
6	CO6	Choose appropriate construction equipment for desired construction works.

Syllabus:

Course Content	
Unit I	Excavating Equipment: Different types of Excavator, their selection, Type of loaders their bucket attachments, loader production rates, calculation of wheel loader production. Compacting and Stabilization Equipment: Compaction of soil and rock, types of compacting equipment, roller production estimating, Dynamic compaction, Soil stabilization- Lime stabilization and Cement stabilization. [8 hrs]
Unit II	Earthmoving Equipment: Tractors and attachments, dozers and rippers, scrapers, shovels, draglines, trenching machines, clamshell, hoes, trucks and wagons, dumpers, rollers and compactors [6 hrs]
Unit III	Pile driving Equipment: Types, pile driving hammers, single acting and double acting, differential acting hammers, hydraulic and diesel hammers, vibratory drivers Pumping Equipment: Reciprocating, diaphragm & centrifugal pumps, well point system. [10 hrs]
Unit IV	Concrete Manufacture, transport, placing and compacting equipment, mixers, central batching and mixing plants, transit mixers, concrete pumps. Asphalt Mix Production and Placement - Asphalt Plants, and Paving Equipment. [7 hrs]
Unit V	Hoisting Equipment, builder's hoists, forklifts, cranes, belt-conveyors, cableways, ropeways. Planning Process for Equipment and Methods; Cost of Owning and Operating, Depreciation. Equipment Life and Replacement Procedures - Physical, profit and economic life, Replacement analysis [5 hrs]

Text Books:	
1	Construction Planning, Equipments and Methods. R. L. Peurify, TMH, 1996
2	Construction Equipment and its Planning and Applications, Mahesh Varma, Metropolitan Book Co. (P) Ltd., New Delhi, India.
Reference Book:	
1	Construction Machinery and Equipment in India, (A compilation of articles Published in Civil Engineering and Construction Review), Publish by Civil Engineering and Construction Review New Delhi, 1991

Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1.	Dr. Rahul Ralegaonkar	Professor	VNIT, Nagpur
2.	Dr. Anant Pande	Professor	YCCE, Nagpur
3.	Mrs. Atika Ingole	Assistant Professor	JDCEM, Nagpur
4.	Mr. Atul Gautam	Assistant Professor	JDCEM, Nagpur
5.	Mr. Parag Pal	Alumni	SAI Consulting Engineers PVT. Ltd, Bangalore

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE03C	Environmental Impact Assessment and Life Cycle Analysis	3	0	-	3

Prerequisites for the course	
1.	Awareness of sustainable development concepts and practices
2.	Basic knowledge of statistics and data analysis
3.	Sustainable development concepts and practices

Prior Reading Material/useful link	
1.	https://www.youtube.com/watch?v=XKA47nPaeLU
2.	https://www.youtube.com/watch?v=xBEpm79pXaw
3.	https://www.youtube.com/watch?v=8v4sZSDz484

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Recall the concept of Sustainable Development and justify the methods of achieving SD.
2	CO2	Explain the importance of EIA as an integral part of planning process.
3	CO3	Identify the environmental attributes.
4	CO4	Analyze the role of public participation in environmental decision making process and life cycle assessment.
5	CO5	Choose the different methodologies to predict and assess the impacts of project on various aspects of environment.
6	CO6	Predict the Statistics of Environmental Data.

Syllabus:

Course Content	
Unit I	The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report [8 hrs]
Unit II	Environmental attributes-Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods- Ad-hoc methods, Checklists methods [6 hrs]
Unit III	An Introduction to Sustainability Concepts and Life Cycle Analysis (Introduction, Material flow and waste management, what it all means for an engineer? Water energy and food nexus) [6 hrs]
Unit IV	Environmental Data Collection and LCA Methodology (Environmental Data Collection Issues, Statistical Analysis of Environmental Data, Common Analytical Instruments [6 hrs]
Unit V	Life Cycle Assessment – Detailed Methodology and ISO Framework (Detailed Example on LCA Comparisons, LCA Benefits and Drawbacks, Historical Development and LCA Steps from ISO. [6 hrs]

Text Books:	
1	Environmental Impact Analysis Handbook – by Rau Whootten; McGraw Hill publications
2	Environmental Impact Assessment – by Larry Canter; McGraw Hill publications
Reference Book:	
1	Environmental Impact Analysis – A Decision Making Tool by R K Jain
2	Handbook of Environment Impact Assessment by Judith Petts; McGraw Hill publications

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1.	Dr. Prashant Pawade	Professor	GHRCOE, Nagpur
2.	Dr. Kshitija Kadam	Professor	GCOE, Nagpur
3.	Mr. Nilesh Pal	Assistant professor	JDCOEM, Nagpur
4.	Mr. Gaurav Rangari	Assistant professor	JDCOEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE03D	Advanced Design of Concrete Structures	3	0	-	3

Prerequisites for the course	
1	Different types of structural members and their behavior under different loading conditions.
2.	Different types of structural systems, including beams, columns, slabs, and footings.
3.	Behavior of structural members under different types of loading, including axial, bending, shear, and torsion.

Prior Reading Material/useful link	
1	https://www.youtube.com/watch?v=Q8_qR7oFKRA
2.	https://www.youtube.com/watch?v=H1sWkfHb2Hg
3.	https://www.youtube.com/watch?v=miPwo-Y1GGQ

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Recognize the design philosophy of reinforced concrete structures.
2	CO2	Understand the behavior and failure modes different concrete members
3	CO3	Apply the knowledge & skills in practical problems.
4	CO4	Analyze the results in designing various concrete member of structure.
5	CO5	Evaluate and design a complete structural system through a comprehensive design project.
6	CO6	Produce a complete project document and present in a concise and complete manner to include structural drawings and structural calculations.

Syllabus:

Course Content	
Unit I	Design of circular water tank with roof slab/dome resting on ground by approximate methods/IS code method (by Working Stress Method). Design of rectangular water tank with one-way roof slab resting on ground by approximate methods/ IS code method (by Working Stress Method). [7 hrs]
Unit II	Analysis and design of columns subjected to biaxial moments, design of long columns. [6 hrs]
Unit III	Design of RCC Cantilever and Counter-fort Retaining wall. Design of Dog Legged Staircase. [8 hrs]
Unit IV	Design of combined footing (Rectangular footing / Trapezoidal footing) [8 hrs]
Unit V	Moment redistribution: Analysis and Design of fixed beam, propped cantilever, two-span symmetric continuous beam. [6 hrs]

Text Books:	
1	Illustrated Design of Reinforced Concrete Buildings, V. L. Shah and S. R. Karve, 9th Edition, Standard Publisher Distributors.
2	Reinforced Concrete Design, S. Sinha, 3rd Edition, Tata McGraw Hill Publications.
3	Fundamentals of Reinforced Concrete Design, M. L. Gambhir, 1st Editions, PHI Learning Pvt. Ltd. 4. Limit State Design of Reinforced Concrete, P. C. Varghese, 2nd Edition, PHI Learning Pvt. Ltd.
4	Reinforced Concrete Design, D. Menon and S. Pillai, 3rd Edition, Tata McGraw-Hill publications
Reference Book:	
1	Limit State Design of Reinforced Concrete (As per IS 456:2000), Dr. B. C. Punmia, A.K. Jain and Dr. A. K. Jain, 1st Edition, Laxmi publications.
2	Reinforced Concrete: Limit State Design, Ashok K. Jain, 7th Edition, Nem Chand and Brothers Publishers.
3	Design of Foundation Systems: Principles and Practices, Nainan P. Kurian, 3rd Edition, Alpha Science International Publisher.
4	Practical Design of Reinforced Concrete Structures, Karuna Moy Ghosh, 1st Edition, PHI Learning Pvt. Ltd.
5	Limit State Theory and Design of Reinforced Concrete, Dr. V. L. Shah and Dr. S. R. Karve, 8th Edition, Structures Publications

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4.	Mr. Shahrukh Kureshi	Assistant Professor	JDCEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7TE03E	Environmental Geo-technology	3	0	-	3

Prerequisites for the course	
1	Basic knowledge of geotechnical engineering, soil mechanics, and environmental science.
2.	Understanding of waste management practices and environmental regulations.
3.	Knowledge of soil properties and behavior, including Atterberg limits, shear strength, and permeability.
4.	Understanding of landfill design and components, including liner systems and leachate collection.

Prior Reading Material/useful link	
1	https://www.twi-global.com/technical-knowledge/faqs/geotechnical-engineering
2.	https://www.sciencedirect.com/topics/earth-and-planetary-sciences/landfill-design
3.	https://www.queensu.ca/research/features/engineering-solutions-leachate-liners-landfills-and-learning

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Define the various geo-environmental parameters.
2	CO2	Explain soil water environment interaction, application of waste and its disposal and soil remediation.
3	CO3	Identify geo-environmental applications and soil remediation.
4	CO4	Examine soil water environment interaction, landfill components and variation in engineering properties of soil.
5	CO5	Determine effect of geo-environmental parameter on soil.
6	CO6	Choose waste management system, water and gas disposal facility, and site for landfilling and soil remediation methods.

Syllabus:

Course Content	
Unit I	Introduction and Soil-water-environment interaction Introduction to geo-environmental Engineering, Soil-water-environment interaction relating to geotechnical problems. Waste: source, classification and management of waste, Physical, chemical and geotechnical characterization of Municipal solid waste, Impact of waste dump and its remediation [6 hrs]
Unit II	Geotechnical application of waste and disposal Geotechnical use of different types such as Thermal power plant waste, MSW, mine waste, industrial waste. Waste disposal facilities, Parameters controlling the selection of site for sanitary and industrial landfill. Site characterization. MoEF guidelines. [6 hrs]
Unit III	Landfill Components Landfill Layout and capacity components, components of landfill and its functions type and functions of liner and cover systems, Compacted clay liner, selection of soil for liner, methodology for construction. [6 hrs]
Unit IV	Leachate, Gas Management and Geosynthetics Management of Leachate and gas. Various components of leachate collection and removal system and its design, gas disposal/utilization. Closure and post closure monitoring system. Geosynthetics- Geo membranes - geosynthetics clay liners -testing and design aspects. [8 hrs]
Unit V	Soil remediation Investigation of contaminated soil, sampling, assessment, Remediation, , thermal remediation, pump and treat method, Phyto remediation and electro- kinetic remediation , Change in engineering properties due to change in environment, variation in Engineering properties of soil– Atterberg’s limits, shear strength, permeability and swelling due to change in environment. [8 hrs]

Text Books:

1	Hsai–yang Fang., “Introduction to Environmental Geo-technology” CRC press New York, 1997
Reference Book:	
1	Cairmey .T. , “Contaminated land problems and solutions”, Blackie Academic & Professional, New York, 1993.

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4.	Mr. Gaurav Rangari	Assistant professor	JDCOEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CEOEC3A	Smart City	4	0	0	4

Prerequisites for the course	
1	Urban Planning and Design
2	Information and Communication Technology
3	Social and Cultural Dimensions of Urban Development
4	Energy Systems and Sustainability

Prior Reading Material/useful link	
1.	https://www.youtube.com/watch?v=q_XmlG3CwNk
2.	https://www.youtube.com/watch?v=ZAWE5YDHsMY&list=PLbMVogVj5nJSduBmvmmodjeFjX04_0gMjj
3.	https://www.youtube.com/watch?v=tRwy7J7k_g4
4.	https://www.youtube.com/watch?v=mh51mAUexK4&list=PLwdnzlV3ogoXUifhvYB65ILJCZ74o_fAk

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Define the roles and functions of various technologies (sensors, RFID, cloud computing) that can be used for implementing smart cities and their relation to each other to achieve the sustainability goals.
2	CO2	Explain the concept of a smart city and key challenges/problems facing professionals in India and other cities around the world.
3	CO3	Apply the existing technologies to give solutions towards planning and moving a current city towards a smart and sustainable one.
4	CO4	Discover the opportunities of Smart, Sustainable Cities and Smart Transportation based on latest technologies for the managers and policy makers.
5	CO5	Criticize the solutions and plans proposed by others and learn about state-of-the-art strategies for effectively managing the transition from legacy infrastructures to smart urban systems.
6	CO6	Compose a solution/plan for a smart and sustainable city keeping in mind the current Indian scenario.

Syllabus:

Course Content	
Unit I	Introduction to the Smart Cities, Conceptualizing cities as complex socio-technical systems, what is digitalization? General Implications of digitalization, Implications on digitalization on cities, Perspectives on Smart Cities, Challenges of Urban Development, Urban Information System. [6hrs]
Unit II	Smart Urban Energy Systems, Conceptualization of Smart Urban Energy Systems, The infrastructure layer of smart urban energy systems, The services layer of smart urban energy systems, Data/digital layer of smart urban energy systems, Managerial and Policy takeaways. Opportunities of Smart and Sustainable Cities, Intelligent and Sustainable Buildings. [8 hrs]
Unit III	Smart Transportation, Conceptualization of smart urban transportation systems, the "improve" pathway, The "shift" pathway, Transition in Socio- Technical systems, Data/Digital layer, Potential of the digital layer. [6 hrs]
Unit IV	Challenges on the Services layer, Challenges on the Infrastructure layer, Challenges for managers, Challenges for policy-makers. [6 hrs]
Unit V	Internet of Things, Big Data Analysis on City Operation Data, Virtual and Sensible City, Smart and Sustainable City Practice and Research in India and Abroad. [6 hrs]

Text Books:	
1	Smart City on Future Life - Scientific Planning and Construction by Xianyi Li (Jan 1, 2012)
2	The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities) by NicosKomninos (2014)
Reference Book:	
1	Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony Townsend (Oct 7, 2013)

Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1.	Dr. Prashant Pawade	Professor	GHRCOE, Nagpur
2.	Dr. Kshitija Kadam	Professor	GCOE, Nagpur
3.	Mr. Kamlesh Meshram	Assistant Professor	JDCOEM, Nagpur
4.	Mr. Gaurav Rangari	Assistant Professor	JDCOEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CEOEC3B	Robotics in Civil Engineering	4	0	0	4

Prerequisites for the course	
1	Overview of manufacturing processes and technologies.
2	Communication and collaboration in construction projects.
3	Emerging trends and innovations in the construction industry
4	Introduction to electronics and control systems

Prior Reading Material/useful link	
1.	https://www.youtube.com/watch?v=jdFrBtHeJbs&list=PLSGws_74K01-g9nnTMBssGURHawYYQfMQ
2.	https://www.youtube.com/watch?v=cL8K32DB7y8
3.	https://www.youtube.com/watch?v=Uiqlu2gJu3k&list=PLOzRYVm0a65dRU1hBCsd3rqyhjpcGCioi
4.	https://www.youtube.com/watch?v=RcuGxWc0HyQ

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Recall the features of robots in civil engineering.
2	CO2	Understand the manufacturing terminology of robot.
3	CO3	Choose various types of robots in different construction based on their application.
4	CO4	Analyze the system development and problem identification methods
5	CO5	Evaluate the functions and feasibility of working methods of robots.
6	CO6	Adopt systems development methodology for robotics in the field work.

Syllabus:

Course Content	
Unit I	Background and historical development, Automation and Robotics, Applications in construction, Practical robots developed in the construction industry. [6 hrs]
Unit II	Introduction to different types of robots, their features and advantages: Concrete Floor Finishing Robot, Ceiling Panel Position Robot, Activated Concrete cutting Robot, Exterior Wall Painting Robot, Automatic Silo Lining System, Fireproofing Spray Robot, Radio Control Auto-Released Clamp. [8 hrs]
Unit III	Potential benefits including Economic, Safety, and Quality discussions on potential labor issues. Terminology and typical system components, Stationary versus mobile robotics. [6 hrs]
Unit IV	Problem identification methodologies: Fishbone Diagram, Problem Tree, SWOT Analysis, SQUID. Feasibility analysis: Technical, Economic, Legal, Operational, Scheduling feasibilities. [8 hrs]
Unit V	Systems development methodologies: SDLC, the agile approach, and object-oriented systems analysis Case Study. [6 hrs]

Text Books:	
1	Construction Automation And Robotics In Civil Engineering Education Programs by Walter W. Boles" Member, ASCE, and Jing Wang.
2	Advanced Robotics in Civil Engineering and Construction by RoozbehKangari.
Reference Book:	
1	Automation and Robotics in Construction: A Feasibility Study by Kangari R., and Halpin, D. W.

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2.	Dr. Kshitija Kadam	Professor	GCOE, Nagpur
3.	Mr. Kamlesh Meshram	Assistant Professor	JDCEM, Nagpur
4.	Ms. Tejaswini Junghare	Assistant Professor	JDCEM, Nagpur

(Laboratory)

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7L001	Engineering Economics, Estimation and Costing Lab	0	0	2	1

Syllabus:

Sr. No.	Name of Experiments
Term work include detailed study and working of following set of assignments	
1.	Detailed estimate for a two storied RCC or load bearing wall building
2.	Preparing detailed estimate for any four of the following: a. A small culvert b. A stretch of a road about 1 Km. long including earthwork c. A reach of canal about 1 Km. long d. A percolation tank e. A factory shed of steel frame f. Water supply scheme g. Drainage scheme h. Water Treatment plants
3.	Valuation report including valuation certificate for any one of the following: a. A building for residential purpose or commercial purpose b. A hotel c. A theatre
4.	Drafting of Detailed specification for any five civil engineering items. This shall include at least one item each from Roads, Irrigation works, Water Supply, Sanitation and buildings.

Semester	Course Code	Name of Course	L	T	P	Credits
VII	CE7P002	Project I	0	0	6	5

Syllabus:

This course is the next phase of mini project which was conducted in VI Semester followed by the same project batches. Project work shall be evaluated by mid-term seminar/s, the quality of work carried out, project report submission and the viva-voce examination.