



**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](http://www.jdcoem.ac.in)

E-mail: [info@jdcoem.ac.in](mailto: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**

**Course Structure & Evaluation Scheme**

<b>V Semester</b>											
Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE/Ext. Pra.	Total	
1	HSMC	CE5T001	Professional Practice, Law & Ethics	2	0	0	20	20	60	100	2
2	PCC	CE5T002	Fluid Mechanics	2	1	0	20	20	60	100	3
3	PCC	CE5T003	Structural Analysis	2	1	0	20	20	60	100	3
4	PCC	CE5T004	Transportation Engineering	3	0	0	20	20	60	100	3
5	OEC	CEOEC1	Open Elective-I	4	0	0	20	20	60	100	4
6	PCC	CE5L001	Fluid Mechanics Lab	0	0	2	60	0	40	100	1
7	PCC	CE5L002	Structural Analysis Lab	0	0	2	60	0	40	100	1
8	PCC	CE5L003	Transportation Engineering Lab	0	0	2	60	0	40	100	1
9	PROJECT	CE5P004	Mini Project & Seminar	0	0	2	60	0	40	100	1
10	PROJECT	CE5F005	Field Visit III	0	0	0	60	0	40	100	1
11	MC	CE5T005	Consumer Affair	2	0	0	20	20	60	100	AU
				<b>15</b>	<b>2</b>	<b>8</b>					<b>23</b>

## V Semester

Semester	Course Code	Name of Course	L	T	P	Credits
V	CE5T001	Professional Practice, Law & Ethics.	2	0	0	2

Prerequisites for the course	
1	Basic understanding of civil engineering principles and practices
2	Understanding of intellectual property laws and regulations in India
3	Basic knowledge of dispute resolution mechanisms
4	Familiarity with international commercial terms

Prior Reading Material/useful link	
1.	<a href="https://www.procore.com/jobsite/structural-design-in-civil-engineering-definition-basic-principles-and-careers/">https://www.procore.com/jobsite/structural-design-in-civil-engineering-definition-basic-principles-and-careers/</a>
2.	<a href="https://www.indiafilings.com/learn/intellectual-property-laws-in-india/">https://www.indiafilings.com/learn/intellectual-property-laws-in-india/</a>
3.	<a href="https://www.tpsgc-pwpsc.gc.ca/biens-property/sngp-npms/bi-rp/conn-know/reclam-claims/differends-alternative-eng.html">https://www.tpsgc-pwpsc.gc.ca/biens-property/sngp-npms/bi-rp/conn-know/reclam-claims/differends-alternative-eng.html</a>

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Know about the fundamentals of professional practice, ethics, building laws, Intellectual Property Rights and Patents.
2	CO2	Understand the contracts management in civil engineering, Arbitration, Conciliation and Alternative Dispute Resolution system.
3	CO3	Identify the various stakeholders and their role,
4	CO4	Infer about the professional ethics to be carried, different laws and arbitration, and Patent.
5	CO5	Justify the types of roles they are expected to play in the society as practitioners of the civil engineering profession
6	CO6	Develop good ideas of the legal and practical aspects in the profession.

## Syllabus:

Course Content	
Unit I	Professional Practice: Respective roles of various stakeholders, Standardization Bodies, professional bodies, Indian Roads Congress, Developers, Consultants, Contractors, Manufacturers/ Vendors/ Service agencies. Professional Ethics: Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures. [06 hrs]
Unit II	General Principles of Contracts Management: Indian Contract Act, 1972 and amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Cost escalation; Time extensions & Contract documentation; Contract Notices; Wrong practices in contracting Reverse auction; Case Studies; Build- Own-Operate & variations; Public- Private Partnerships; International Commercial Terms [06 hrs]
Unit III	Arbitration, Conciliation and Alternative Dispute Resolution system: Arbitration, Arbitration and expert determination, Extent of judicial intervention; International commercial arbitration; Arbitration agreements; Arbitration tribunal appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision. [06 hrs]
Unit IV	Engagement of Labour and Labour & other construction-related Laws: Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub- contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers. [06 hrs]
Unit V	Law relating to Intellectual property: Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet, Law relating to Patents under Patents Act, 1970, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent. [06 hrs]

Text Books:	
1	B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974
2	Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai.
Reference Book:	
1	Ethics in Engineering- M.W.Martin & R.Schinzinger, McGraw-Hill

### Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1	Dr. Rahul Ralegaonkar	Professor	VNIT, Nagpur
2	Prof. Atika Ingole	Asst. Professor	JDCEM, Nagpur
3	Prof. Tejaswini Junghare	Asst. Professor	JDCEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
V	CE5T002	Design of RC Structure.	3	0	0	3

Prerequisites for the course	
1.	Concrete Technology
2.	Understanding of properties and behavior of materials, especially concrete
3.	Familiarity with common structural elements such as beams, columns, and slabs
4.	Knowledge of different types of loads on structures and how they affect structural behavior
5.	Understanding of different design philosophies for reinforced concrete structures
6.	Ability to perform calculations for flexural, shear, bond, and torsional loads on beams

Prior Reading Material/useful link	
1.	<a href="https://www.youtube.com/watch?v=45ou1yjuoUk">https://www.youtube.com/watch?v=45ou1yjuoUk</a>
2.	<a href="https://www.youtube.com/watch?v=WSRqJdT2COE">https://www.youtube.com/watch?v=WSRqJdT2COE</a>
3.	<a href="https://structuralengineeringbasics.com/types-of-loads-on-structures/">https://structuralengineeringbasics.com/types-of-loads-on-structures/</a>
4.	<a href="https://www.youtube.com/watch?v=spugjcuPiU">https://www.youtube.com/watch?v=spugjcuPiU</a>

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Recall the basic concept of Concrete Technology and relevant IS code.
2	CO2	Identify the principles of analysis and design of RC structures viz Beam, Column, footing etc.
3	CO3	Apply the knowledge and skills in practical problems.
4	CO4	Analyze the results in designing various concrete members.
5	CO5	Design the various concrete members of structures like beam, column, footing and slab with relevant IS code.
6	CO6	Compare the results with relevant software's.

**Syllabus:**

Course Content	
Unit I	<b>Design Philosophies and Analysis:</b> Design philosophies of RC structures (WSM, LSM), Structural elements, Loads on structures, and Structural properties of concrete, Role of structural engineer. RC sections in flexure - theory & analysis - singly and doubly reinforced - rectangular and flanged sections. [07 hrs]
Unit II	<b>Beams:</b> Design of beams for flexure, shear, bond and torsion: simply supported, continuous & cantilever, redistribution of moments. [07 hrs]
Unit III	<b>Design of Columns:</b> Short & long - axially loaded, uniaxial & biaxial moments. [07 hrs]
Unit IV	<b>Column Footings:</b> Isolated column footings - axial load, uniaxial and biaxial moments, eccentric footing. Footings in difficult soil conditions. [07 hrs]
Unit V	<b>Slabs:</b> Slabs - one way and two way - simply supported, cantilever and continuous. Design of staircase - Dog legged and open well. [07 hrs]

**Text Books:**

1	Shah V. L. and Karve S. R., "Limit State Theory and Design of Reinforced Concrete", Structures Publications, Pune, 2005.
2	Punmia B. C., Jain A. K. and Jain A. K., "Limit State Design of R.C. Structures", Laxmi Publications Pvt. Ltd., 2008.

**Reference Book:**

1	Dayaratnam, "Design of Reinforced Concrete Structures" Oxford and IBH, New Delhi, 2011.
2	Sinha N. C., Roy S. K., "Fundamentals of Reinforced Concrete", S. Chand and Co., New Delhi, 2010.

**Contribution for Syllabus Design:**

Sr. No.	Name of Person	Designation	Organization
1	Dr. Anant Pande	Professor	YCCE, nagpur
2	Dr. K. N. Kadam	Associate Professor	GCOE, Nagpur
3	Prof. Atika Ingole	Assistant Professor	JDCEM, Nagpur
4	Prof. Atul Gautam	Assistant Professor	JDCEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
V	CE5T003	Fluid Mechanics	2	1	0	3

Prerequisites for the course	
1	Basics of Civil Engineering
2	Basic concepts of fluid mechanics, such as viscosity, density, pressure, and fluid flow
3	Mathematics and physics, including calculus, differential equations, and mechanics

Prior Reading Material/useful link	
1.	Basic of Civil (A Hand Book For Civil Engineering Students)By R. Khan
2.	<a href="https://byjus.com/physics/properties-of-fluids/">https://byjus.com/physics/properties-of-fluids/</a>
3.	<a href="https://www.youtube.com/watch?v=clVwKynHpB0">https://www.youtube.com/watch?v=clVwKynHpB0</a>
4.	<a href="https://www.youtube.com/watch?v=brN9citH0RA">https://www.youtube.com/watch?v=brN9citH0RA</a>

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Define the physical properties of fluid, its types and fundamental concepts of fluid mechanics along with the equilibrium conditions of stability.
2	CO2	Explain the terms in hydraulics and estimate the forces acting on immersed bodies in fluid statics and measure the pressure force acting on fluid in motion.
3	CO3	Apply the Bernoulli's Equation for the discharge and velocity measurements.
4	CO4	Analyze flow through the pipes, Pipe networks and boundary layer theories.
5	CO5	Evaluate the energy losses and pressure differences in laminar and turbulent flow.
6	CO6	Analyze the dimensional analysis and visualize fluid flow phenomenon in civil engineering applications.

**Syllabus:**

Course Content	
Unit I	Introduction: Concepts of fluid and fluid mechanics, basic properties of fluids, Capillarity and its effect, Study of effect of pressure and temperature on various fluid properties. Buoyancy and Floatation: Buoyant force and center of buoyancy, Archimedes principle, metacenter and meta centric height, Stability conditions of floating bodies. Pressure Measurement: Fluid pressure, Variation of fluid pressure with depth, pressure head, atmospheric, gage, vacuum pressure, pressure measurement devices, Center of pressure and total pressure for fluid masses subjected to horizontal, vertical and inclined plane surface. [08 hrs]
Unit II	Kinematics of flow: Velocity and its variation with space and time. Acceleration of fluid Particles, Lagrangian and Eulerian approaches in fluid flow description, type of flows. Equation of continuity in cartesian co- ordinate systems. Fluid Dynamics: Forces influencing motion, various equations of motion, Bernoulli's equation and Its application and limitations, Kinetic energy correction factor. [08 hrs]
Unit III	Fluid Measurement: Venturimeter, Orifice meter, Pitot tube. Orifice. Flow through Pipes: Losses in pipe flow, hydraulic gradient line and Total energy gradient line. Pipes in series and parallel and branched pipe, Water hammer pressure, flow through siphon. Laminar Flow in Circular Pipes: Laminar flow in circular pipes and parallel plates; Velocity and shear stress. [10 hrs]
Unit IV	Dimensional analysis: Definition, fundamentals and derived dimensions, methods and its application. Dimensionless numbers and its significance and introduction to theory of model. Flow through Open Channel: Introduction to open channel flow; Types of channel, Geometrical properties, Types of flow in open channel, Chezy's equation; Manning's equation; determination of discharge; normal depth; most economical channel section. [10 hrs]
Unit V	Gradually Varied Flow (GVF): Introduction to GVF; Equation of gradually varied flow; analysis of Gradually varied flow. Rapidly Varied Flow (RVF): theory and classification and analysis of hydraulic jump, Energy dissipation. Hydraulic Machines: Pumps: Basics, operating characteristics, efficiency of Centrifugal and reciprocating Pump. [08 hrs]

Text Books:	
1	Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K. Kataria & Sons
2	Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications
Reference Book:	
1	Fluid Mechanics and Hydraulic Machines by R.K. Rajput, S.Chand & Co.
2	Fluid Mechanics by Frank .M. White, McGraw Hill Publishing Company Ltd.

## Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1	Dr. Rahul Ralegaonkar	Professor	VNIT, Nagpur
2	Prof. Atika Ingole	Asst. Professor	JDCEM, Nagpur
3	Prof. Tejaswini Junghare	Asst. Professor	JDCEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
V	CE5T004	Structural Analysis	2	1	0	3

Prerequisites for the course	
1.	Solid mechanics
2.	Mechanics of Rigid Bodies
3.	Basic knowledge of mechanics of materials, including stress, strain, deformation, and equilibrium equations
4.	Understanding of the properties of materials commonly used in structural engineering, such as steel, concrete, and timber
5.	Knowledge of basic mathematics, including calculus and linear algebra
6.	Familiarity with the principles of statics and dynamics

Prior Reading Material/useful link	
1.	<a href="https://www.bu.edu/moss/mechanics-of-materials-strain/">https://www.bu.edu/moss/mechanics-of-materials-strain/</a>
2.	<a href="https://www.bu.edu/moss/mechanics-of-materials-torsion/">https://www.bu.edu/moss/mechanics-of-materials-torsion/</a>
3.	<a href="https://structuralengineeringbasics.com/what-types-of-construction-building-materials/">https://structuralengineeringbasics.com/what-types-of-construction-building-materials/</a>
4.	<a href="https://www.planradar.com/gb/top-15-innovative-construction-materials/">https://www.planradar.com/gb/top-15-innovative-construction-materials/</a>

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Recall the concepts involved in various methods of structural analysis.
2	CO2	Compare the applications of analysis methods and their respective theorems.
3	CO3	Build the Shear force and Bending Moment diagrams and fixed end moments for various methods.
4	CO4	Analyse the frame structures, trusses, arches etc. subjected to various loading conditions.
5	CO5	Evaluate the moments produced due to external loading.
6	CO6	Compile the results of analysis and predict the behaviour of structure subjected to loading.



**Syllabus:**

Course Content	
Unit I	Introduction of Statically indeterminate Structures: Concept of Static indeterminacy, Analysis of fixed and continuous beams by theorem of three Moments, effects of sinking of support. [08 hrs]
Unit II	Strain energy method as applied to the analysis of redundant frames and redundant truss up to two Degrees, Analysis of Two-Hinged arches. Three Hinged Arch, parabolic arches. Buckling of columns and beams. Eulers and Rankines formula. [08 hrs]
Unit III	Slope deflection method as applied to indeterminate beams & continuous beams and portal frame. Moment Distribution Method applied to frames and beams (Non-Sway and Sway). [08 hrs]
Unit IV	Kani's method applied to symmetrical and unsymmetrical frames with sway (Upto one bay two storey). Flexibility Method of structural analysis, Introduction to flexibility method up to two DOF. [08 hrs]
Unit V	Direct stiffness method as applied to continuous beams and portal frames Formulation of stiffness matrix for TRUSS/BAR element, Member load matrix and structure load matrix formulations. Basic concept of structural analysis software that can be used to analyze, design, and model structures in 3D. [08 hrs]

Text Books:	
1	Ramamrutham S.S. and Narayan R., "Theory of Structures", Dhanpat Rai and Son's, New Delhi.
2	Vazirani V. N. and Ratwani M. M., "Analysis of Structures", Khanna Publishers, New Delhi, 1994.
	Bhavikatti S. S., "Structural Analysis (Volume II), Vikas Publishing House Ltd., Delhi.
Reference Book:	
1	Pandit G. S. and Gupta S. P., "Structural Analysis", Tata McGraw Hills publishing company Ltd., New Delhi

**Contribution for Syllabus Design:**

Sr. No.	Name of Person	Designation	Organization
1	Dr. Anant Pande	Professor	YCCE, nagpur
2	Dr. K. N. Kadam	Associate Professor	GCOE, Nagpur
3	Prof. Atika Ingole	Assistant Professor	JDCEM, Nagpur
4	Prof. Tina Khandale	Assistant Professor	JDCEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
V	CE5T005	Transportation Engineering	3	0	0	3

Prerequisites for the course	
1	Basics of Civil Engineering
2	Understanding of the properties of materials commonly used in transportation infrastructure, such as concrete, asphalt, and steel
3	Knowledge of basic principles of civil engineering, including surveying, structural analysis, and design
4	Understanding of basic principles of geotechnical engineering, including soil mechanics and foundation design

Prior Reading Material/useful link	
1.	Basic of Civil (A Hand Book For Civil Engineering Students)By R. Khan
2.	<a href="https://www.conserve-energy-future.com/sustainable-construction-materials.php">https://www.conserve-energy-future.com/sustainable-construction-materials.php</a>
3.	<a href="https://www.cement.org/cement-concrete/how-cement-is-made">https://www.cement.org/cement-concrete/how-cement-is-made</a>
4.	<a href="https://www.youtube.com/watch?v=Rq6oZdIOUrM">https://www.youtube.com/watch?v=Rq6oZdIOUrM</a>

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Choose the relevant mode of transportation.
2	CO2	Explain different objectives and requirements of Highway Development and Planning, Alignments and Tests on Highway materials.
3	CO3	Organize the utility of construction materials and conduction of traffic signaling.
4	CO4	Illustrate and evaluate the parameters of Transportation Engineering
5	CO5	Appraise the components of transportation modes.
6	CO6	Design various Geometric Features of Highways.

**Syllabus:**

Course Content	
Unit I	Introduction: Importance of Transportation, Modes of Transportation, Historical Development of Road Construction, Highway Development in India, Necessity of Highway Planning, Road Classification, Highway Planning in India, Road Alignment and Surveys. [08 hrs]
Unit II	Geometric Design: Cross Section elements, Sight distances, Horizontal alignment, Vertical Alignment, Curves, Design of Super Elevation, Widening. Pavement Design: Types of Pavements & Characteristic, Design parameters, Axle & Wheel load, tyre pressure, ESWL for dual Wheels, repetitions, Design of Flexible Pavement, Design of Rigid Pavement, Analysis of load & temperature stresses of rigid pavement, Joints. [08 hrs]
Unit III	Traffic Engineering: Traffic Characteristics, Traffic Studies, Design of Intersection and Parking Space, Traffic Operation, Fundamental Relationships; Traffic Signs, Signal design by Webster's method, Highway Lighting, Planning and Administration. Road Accidents and Safety: Causes and Types of Accidents, Control Measures, Introduction to Intelligent Transport Systems (ITS). [08 hrs]
Unit IV	Highway Construction Materials, Methods & Maintenance: Highway Materials: Properties of sub grade and pavement component materials, Tests on subgrade soils, aggregates and bituminous materials. Application of Geosynthetics, Earthen/Gravel road, Water Bound Macadam, Wet Mix macadam, Bituminous pavement. Cement Concrete Pavement: Pavement failures, maintenance and strengthening measures. [08 hrs]
Unit V	Railways: Components of Railway, Geometric design of railway track, Gauge, Gradients speed, super elevation, cant deficiency, Negative super elevation, objectives of transition curves, grade compensations. Airways: Location and Spacing of Airports; Geometrical Design Considerations – Taxiways, Runways and Aprons; Runway Orientation – Wind rose Diagram; Terminal Area Planning, Airport Drainage. Tunnels: Classification, Surveys, Drainage, Ventilation, Lighting and Lining. [08 hrs]

Text Books:	
1	Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'HighwayEngineering', Revised, 10th Edition, Nem Chand & Bros, 2017
2	Kadiyalai, L.R., 'Traffic Engineering and Transport Planning', Khanna Publishers.
3	ParthaChakraborty and Animesh Das ' Principles of TransportationEngineering, PHI Learning,
4	Srinivasa Kumar, R, Textbook of Highway Engineering, Universities Press,2011.
Reference Book:	
1	Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student Edition, 2009.

2	Fred L. Mannering, Scott S. Washburn, Walter P. Kilaeski, 'Principles of Highway Engineering and Traffic Analysis', 4th Edition, John Wiley
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Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1	Dr. K. N. Kadam	Associate Professor	GCOE, Nagpur
2	Prof. Shital Navghare	Assistant Professor	JDCOEM, Nagpur
3	Prof. Gaurav Rangari	Assistant Professor	JDCOEM, Nagpur

Open Elective-I

Semester	Course Code	Name of Course	L	T	P	Credits
V	CE5O001A	Disaster Management	4	0	0	4

Prerequisites for the course	
1	Ecology and ecosystems
2	Water and air pollution
3	Environmental regulations and standards
4	Environmental impact assessments and mitigation measures

Prior Reading Material/useful link	
1.	<a href="https://www.youtube.com/watch?v=-j1rjB_-DhI">https://www.youtube.com/watch?v=-j1rjB_-DhI</a>
2.	<a href="https://www.youtube.com/watch?v=4AuwG2G_ERU&amp;list=PLF5457B8AE71516CE">https://www.youtube.com/watch?v=4AuwG2G_ERU&amp;list=PLF5457B8AE71516CE</a>
3.	<a href="https://www.youtube.com/watch?v=9-MEVIXr3Ko&amp;list=PLLy_2iUCG87CkrNdXME16BCptwGx1fl67">https://www.youtube.com/watch?v=9-MEVIXr3Ko&amp;list=PLLy_2iUCG87CkrNdXME16BCptwGx1fl67</a>
4.	<a href="https://www.youtube.com/watch?v=_iLdyhgFv1U">https://www.youtube.com/watch?v=_iLdyhgFv1U</a>

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Acquire the knowledge of the importance and necessity of water supply and solid as well as liquid waste treatment scheme.
2	CO2	Understand the various unit operations and unit processes in water & waste water treatment and flow sheet of conventional municipal water, waste water and solid waste treatment plant.
3	CO3	Evaluate control methods based on various principles to reduce the effect of water, air & Sound pollution.
4	CO4	Design an ecofriendly system for reuse and recycling of solid, E-waste and liquid waste.
5	CO5	Design and develop safe, effective and efficient water supply system and wastewater and solid disposal system.
6	CO6	Formulate the modeling of water & air quality through the use of different software's.

**Syllabus:**

Course Content	
Unit I	Environment and its components Sources of waste water generation, Characteristics of wastewater, disposal standard, Waste water treatment & disposal, effects of water pollution: water borne diseases, effect on land & vegetation. Conventional waste water treatment plant and function. [08 hrs]
Unit II	Introduction to air pollution: definition of air pollutants, atmosphere and its zone, composition of various gases in clean atmosphere, air pollution episodes, classification of air pollutants with their sources, effects of air pollutants on man, animals, plants and materials, Lapse rates & atmospheric stability, meteorological parameters affecting dispersion of air pollutants, plume behavior. [08 hrs]
Unit III	Introduction to solid waste management: Classification, sources, components, quantity and per capita contribution of solid waste. Physical and chemical characteristics, sampling and analysis of solid waste. Collection and transportation of solid waste: methods of collection, equipment used for collection and transportation of solid waste. [08 hrs]
Unit IV	Introduction to E-waste management: Sources of E-waste, its characteristics, its effects and its disposal methodology. [08 hrs]
Unit V	Noise pollution: Sources of sound, ill effects of noise pollution, control measures, standards of noise pollution. [08 hrs]

Text Books:	
1	Environmental Engineering, Volume I & II by B.C. Punmia (Laxmi Publishers)
2	Environmental Engineering, Volume I & II by S.K.Garg (Khanna Publishers)
Reference Book:	
1	Air pollution by M. N. Rao and H. V. N. Rao, (Tata McGraw Hill publications)
2	Environmental Pollution Control Engineering by C. S. Rao, (Wiley Estern Ltd.)
3	Solid waste management in developing countries by A. D. Bhide and B. B. Sundersan (INSDOC, New Delhi)
4	Water supply & Sanitary Engineering by G. S. Birdie (DhanpatRai Publication)

**Contribution for Syllabus Design:**

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1	Dr. Rahul Ralegaonkar	Professor	VNIT, Nagpur
2	Prof. Atika Ingole	Asst. Professor	JDCEM, Nagpur
3	Prof. Kamlesh Meshram	Asst. Professor	JDCEM, Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
V	CE5O001A	Basics of Environmental Pollution	4	0	0	4

Prerequisites for the course	
1	Ecology and ecosystems
2	Water and air pollution
3	Environmental regulations and standards
4	Environmental impact assessments and mitigation measures

Prior Reading Material/useful link	
1.	<a href="https://www.youtube.com/watch?v=-j1rjB_-DhI">https://www.youtube.com/watch?v=-j1rjB_-DhI</a>
2.	<a href="https://www.youtube.com/watch?v=4AuwG2G_ERU&amp;list=PLF5457B8AE71516CE">https://www.youtube.com/watch?v=4AuwG2G_ERU&amp;list=PLF5457B8AE71516CE</a>
3.	<a href="https://www.youtube.com/watch?v=9-MEVIXr3Ko&amp;list=PLLy_2iUCG87CkrNdXME16BCptwGx1fl67">https://www.youtube.com/watch?v=9-MEVIXr3Ko&amp;list=PLLy_2iUCG87CkrNdXME16BCptwGx1fl67</a>
4.	<a href="https://www.youtube.com/watch?v=_iLdyhgFv1U">https://www.youtube.com/watch?v=_iLdyhgFv1U</a>

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Course Content	
Unit I	Environment and its components Sources of waste water generation, Characteristics of wastewater, disposal standard, Waste water treatment & disposal, effects of water pollution: water borne diseases, effect on land & vegetation. Conventional waste water treatment plant and function. [08 hrs]
Unit II	Introduction to air pollution: definition of air pollutants, atmosphere and its zone, composition of various gases in clean atmosphere, air pollution episodes, classification of air pollutants with their sources, effects of air pollutants on man, animals, plants and materials, Lapse rates & atmospheric stability, meteorological parameters affecting dispersion of air pollutants, plume behavior. [08 hrs]
Unit III	Introduction to solid waste management: Classification, sources, components, quantity and per capita contribution of solid waste. Physical and chemical characteristics, sampling and analysis of solid waste. Collection and transportation of solid waste: methods of collection, equipment used for collection and transportation of solid waste. [08 hrs]
Unit IV	Introduction to E-waste management: Sources of E-waste, its characteristics, its effects and its disposal methodology. [08 hrs]
Unit V	Noise pollution: Sources of sound, ill effects of noise pollution, control measures, standards of noise pollution. [08 hrs]

Text Books:	
1	Environmental Engineering, Volume I & II by B.C. Punmia (Laxmi Publishers)
2	Environmental Engineering, Volume I & II by S.K.Garg (Khanna Publishers)
Reference Book:	
1	Air pollution by M. N. Rao and H. V. N. Rao, (Tata McGraw Hill publications)
2	Environmental Pollution Control Engineering by C. S. Rao, (Wiley Estern Ltd.)
3	Solid waste management in developing countries by A. D. Bhide and B. B. Sundersan (INSDOC, New Delhi)
4	Water supply & Sanitary Engineering by G. S. Birdie (DhanpatRai Publication)

**Contribution for Syllabus Design:**

Sr. No.	Name of Person	Designation	Organization
1	Dr. Rahul Ralegaonkar	Professor	VNIT, Nagpur
2	Prof. Atika Ingole	Asst. Professor	JDCOEM, Nagpur
3	Prof. Kamlesh Meshram	Asst. Professor	JDCOEM, Nagpur



### Open Elective-I

Semester	Course Code	Name of Course	L	T	P	Credits
	CE50001B	Disaster Management	4	0	0	4

Prerequisites for the course	
1	Basic knowledge of natural disasters and their causes
2	Understanding of the social, economic, and environmental impacts of disasters
3	Basic knowledge of emergency management and disaster response
4	Knowledge of the roles and responsibilities of different stakeholders in disaster management, such as governments, NGOs, and communities
5	Familiarity with international frameworks and strategies related to disaster risk reduction and management

Prior Reading Material/useful link	
1.	Basic of Civil (A Handbook For Civil Engineering Students)By R. Khan
2	<a href="https://leverageedu.com/blog/what-is-a-natural-disaster/">https://leverageedu.com/blog/what-is-a-natural-disaster/</a>
3	<a href="https://ce.uci.edu/areas/facilities/emergency/">https://ce.uci.edu/areas/facilities/emergency/</a>

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Acquire the knowledge about disasters and its management.
2	CO2	Understand the role of role of different government & social agencies for disaster management.
3	CO3	Classify the disasters, its preparedness and responses.
4	CO4	Evaluate the disaster preparedness and extent of risk and cost assessment.
5	CO5	Solve the crises using the management and different roles involved in it.
6	CO6	Summarize provisions, management of disaster, post disaster condition & its management.

**Syllabus:**

Course Content	
Unit I	Definitions: Hazard, Risk, Vulnerability, Resilience, Disaster, Safe, Compound (combination) disaster, Humanitarian crisis, Complex humanitarian emergency, Refugees versus internally displaced people. Natural Disasters: Hydrological, Wind-related, Geo-physical, Hydro- Geological and Climatic, Flood, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic Eruptions, Heat and Cold Waves Climate Change: Global Warming, Sea Level Rise, Ozone Depletion. Man-Made Disasters: Nuclear Disasters, Chemical Disasters, Biological Disasters, Building Fire, Coal Fire, Forest Fire, Oil Fire, Air Pollution, Water Pollution, Deforestation, Industrial Pollution, Road Accidents, Rail Accidents, Air Accidents, Sea Accidents. [08 hrs]
Unit II	The Management of Disasters: Introduction, Disasters throughout history, The history of disaster management (Ancient history, Modern roots, Civil defense: the birth of modern emergency management), Capacity by demand: the 1970s and 1980s (The International Decade for Natural Disaster Reduction, The Yokohama Strategy: global recognition of the need for disaster management), The United Nations International Strategy for Disaster Reduction, The Hyogo Framework for Action, The Sendai Framework for Disaster Risk Reduction, Modern disaster management: a four-phase approach. [08 hrs]
Unit III	International disaster management, Disasters, poverty, and development, Disaster trends Risk & Cost Assessment: Geographical conditions, Population, Living habits, Threats, Extent of damages to the lives, agricultural area, industrial units, Awareness & Safety Program. Relief arrangement & essential components, Shelters, Rescue & search tools & equipment, transport facilities. Cost Assessment of each unit and funding. [08 hrs]
Unit IV	Disaster Preparedness: Concept and Nature, Planning, Disaster Preparedness for People with Special Needs/Vulnerable Groups, Disaster Preparedness with Relevance to Housing, Infrastructure and Livestock, Community Based Disaster Preparedness Plan, Role of Information, Education, Communication, and Training, Disaster Preparedness: Role Play by Government and Social Groups. Information Technology: Role in Disaster Preparedness with Special Reference to Geographical Information System, Use and Application of Emerging Technologies in Disaster Preparedness. [10 hrs]
Unit V	Disaster Response: Disaster Response Plan, Communication, Participation, and Activation of Emergency Preparedness Plan, Logistics Management, Needs and Damage Assessment, Psychological Response, Trauma and Stress Management. Rumor and Panic Management, Minimum Standards of Relief, Managing Relief, Funding Relief, Recovery. [10 hrs]

**Text Books:**

1	Satish Modh: Introduction to Disaster Management, Macmillan, 2009
2	Amit Awasthy: Disaster Management: Warning Response and Community Relocation, Global India Publications, 2009

	Jyoti Purohit :Disaster Management in India: Structure and Challenges, 2013
	Prakash Singh: Disaster Response in India, www.MilitaryBookshop.Companyuk, 2011
Reference Book:	
1	D.B.N. Murthy: Disaster Management: Text and Case Studies, Deep and Deep Publications, 2007
2	National Policy on Disaster Management, NDMA, New Delhi, 2009.
3	A Global Report - Reducing Disaster Risk, A Challenge for Development; UNDP Publication, 2004.

Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1	Dr. Rahul Ralegaonkar	Professor	VNIT, Nagpur
2	Prof. Atika Ingole	Asst. Professor	JDCOEM, Nagpur
3	Prof. Nilesh Pal	Asst. Professor	JDCOEM, Nagpur

**(Laboratory)**

Semester	Course Code	Name of Course	L	T	P	Credits
V	CE5L001	Fluid Mechanics Lab	0	0	2	1

Sr. No.	Learning Outcome number	Learning Outcome Statement
1	LO1	Examine the stability condition of ship, discharge and velocity of flow through closed and openconduit.
2	LO2	Evaluate losses in pipes and efficiencies of turbines.
3	LO3	Formulate the Bernoulli's Equation according to the flow.

**Syllabus:**

Sr. No.	Name of Experiments
1	Determination of Meta-centric height of ship model.
2	Verification of Bernoulli's Theorem.
3	Determination of coefficient of discharge for Venturimeter.
4	Determination of coefficient of discharge for Orificemeter.
5	Determination of Hydraulic coefficients of Orifices and mouthpieces.
6	Determination of coefficient of discharge of Notches (Rectangular and Triangular)
7	Determinate of fractional loss in pipes.
8	Determination of minor losses for G I pipe various sections.
9	Efficiency of Pelton Wheel Turbine.
10	Efficiency of Francis Turbine.

Semester	Course Code	Name of Course	L	T	P	Credits
V	CE5L002	Structural Analysis Lab	0	0	2	1

Sr. No.	Learning Outcome number	Learning Outcome Statement
1	LO1	Examine the behavior of portal frame, arches, beam and truss by demonstrating the experiments.
2	LO2	Evaluate the moments, reactions, forces against external loading.
3	LO3	Analyze various structural elements such as beams, frames, truss etc.

**Syllabus:**

Sr. No.	Name of Experiments
1	To study various types of electrical resistance strain gauges.
2	To verify Maxwell's Reciprocal Theorem for simply supported beam.
3	To determine the value of flexural rigidity of given beam and to compare it with theoretical value
4	To study the behavior of different types of struts and to calculate the Euler's buckling load for each case.
5	To study the behavior of a portal frame under different end conditions.
6	To determine the horizontal thrust and to draw the influence line diagram for horizontal thrust of two hinged parabolic arch.
7	To determine the horizontal thrust and to draw the influence line diagram for horizontal thrust of three hinged parabolic arch.
8	To find the deflection of a pin-connected truss experimentally and to verify the result theoretically.
9	To obtain the influence line for bending moment of prismatic fixed beam for cases (a) one end hinged (b) both ends fixed.
10	To verify Castigliano's Theorem for simply supported beam

Semester	Course Code	Name of Course	L	T	P	Credits
V	CE5L003	Transportation Engineering Lab	0	0	2	1

Sr. No.	Learning Outcome number	Learning Outcome Statement
1	LO1	Analyze various engineering quality control test on stone aggregate samples.
2	LO2	Determine various engineering quality control test on tar and bitumen samples
3	LO3	Improve the knowledge about the data collection, methods, and field tests

**Syllabus:**

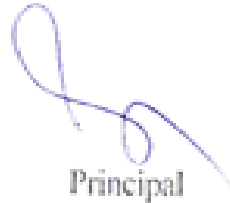
Sr. No.	Name of Experiments
1	Determine the Specific Gravity & Water Absorption of Aggregates.
2	Determine the Crushing Value of Aggregates.
3	Determine the Abrasion Value of Aggregates.
4	Determine the Impact Value of Aggregates.
5	Perform the Shape Test on Aggregates. (Elongation Index and Flakiness Index)
6	Determination of Penetration.
7	Determination of Softening Point of bitumen.
8	Determine the Ductility of bitumen.
9	Determination of Specific gravity of bitumen.
10	Mix Design: Granular Sub-base, Bituminous – DBM, SDBC, BC, etc., Cement concrete.

Semester	Course Code	Name of Course	L	T	P	Credits
V	CE5P004	Mini Project & Seminar	0	0	2	1

Student shall choose a topic of his interest in consultation with faculty in the department. The topic for community project may be related to Civil Engineering area and/or interdisciplinary area. Student shall attempt to collect necessary information and present a summary indicating comprehension of the topic and acquired depth of knowledge. It is desirable to obtain industry or community sponsorship. Simplified tools or devices may be presented in form of working model and a brief report stating development. A power point presentation shall also be submitted.



**BoS, Chairman,  
Civil Engineering,  
JDCOEM, Nagpur**



**Principal**  
**Principal**  
JD College of Engineering & Management  
Khandala, Katol Road  
Nagpur - 481 501