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" GradeAffiliated to DBATU,
RTMNU, MSBTE, MumbaiDepartment of Civil Engineering
"Building Better Development"

Program: B. Tech in Civil Engineering

Teaching Scheme

Branch: Civil Engineering   **Branch Code: CE**

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE/Ext. Pra.	Total	
			III Semester								
1	HSMC	CE3T001	Civil Engineering - Societal & Global Impact	2	0	0	20	20	60	100	2
2	BSC	CE3T002	Engineering Mathematics-III	2	1	0	20	20	60	100	4
3	ESC	CE3T003	Building Drawing and Drafting	2	1	0	20	20	60	100	3
4	ESC	CE3T004	Mechanics of Rigid bodies	2	1	0	20	20	60	100	4
5	ESC	CE3T005	Energy Science and Engineering	3	0	0	20	20	60	100	3
6	PCC	CE3T006	Basic Geology and Geotechnical Engineering	3	0	0	20	20	60	100	3
7	ESC	CE3L001	Building Drawing and Drafting Lab	0	0	4	60	0	40	100	2
8	ESC	CE3L002	Mechanics of Rigid Bodies Lab	0	0	2	60	0	40	100	1
9	PCC	CE3L003	Basic Geology and Geotechnical Engineering Lab	0	0	2	60	0	40	100	1
10	PROJECT	CE3F004	Internship/Field Visit	0	0	0	0	0	50	50	1
11	MC	CE3T007	Innovation and Entrepreneurship Development	2	0	0	10	15	25	50	AU
				16	3	8					24

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE/Ext. Pra.	Total	
			IV Semester								
1	BSC	CE4T001	Life Science	2	0	0	20	20	60	100	2
2	PCC	CE4T002	Hydrology & Water Resource Engineering	2	1	0	20	20	60	100	3
3	PCC	CE4T003	Concrete Technology & Design of RCC Building Elements	2	1	0	20	20	60	100	3
4	PCC	CE4T004	Solid Mechanics	2	1	0	20	20	60	100	3
5	PCC	CE4T005	Surveying and Geomatics	2	0	0	20	20	60	100	2
6	PCC	CE4T006	Materials, Testing & Evaluation	2	0	0	20	20	60	100	2
7	PCC	CE4L001	Concrete Technology & Design of RCC Building Elements Lab	0	0	2	60	0	40	100	2
8	PCC	CE4L002	Solid Mechanics Lab	0	0	2	60	0	40	100	1
9	PCC	CE4L003	Surveying and Geomatics Lab	0	0	4	60	0	40	100	2
10	PROJECT	CE4F004	Internship/Field Visit II	0	0	0	0	0	50	50	1
11	MC	CE4T007	Universal Human Values	3	0	0	10	15	25	50	AU
				15	**3**	**8**					**21**

Semester	Course Code	Name of Course	L	T	P	Credits
III	CE3T001	Civil Engineering - Societal& Global Impact	2	0	0	2

	Prerequisites for the course
1	Basics of Civil Engineering
2	Knowledge of environmental science and sustainability principles.
3	Knowledge of history and social sciences, including economics and political science.
4	Familiarity with architectural design principles and drawing tools.

	Prior Reading Material/useful link
1.	Basic of Civil (A Handbook For Civil Engineering Students)By R. Khan
2.	https://www.youtube.com/watch?v=B8lTtrjxn2s
3.	https://study.com/academy/lesson/environmental-sustainability-definition-and-application.html
4.	https://design.tutsplus.com/articles/the-principles-of-design--cms-33962

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Outline the role of Civil engineering in evolution and revolution of mankind and globally present status of development in India.
2	CO2	Identify the resources utilization for present and future infrastructural projects using various tools
3	CO3	Distinguish the necessities of different conventional as well as futuristic infrastructural projects.
4	CO4	Incorporate the goal of sustainable development to minimize thepotential impacts on the global environment.
5	CO5	Apply various measures for enhancing the building environment, thereby improving quality of life of the occupants.
6	CO6	Evaluate the potential of Civil Engineering for employment creationand its contribution to the GDP.

Syllabus:

Course Content	
Unit I	Introduction to Course and Overview; Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution; Recent major Civil Engineering breakthroughs and innovations; Present day world and future projections, Ecosystems in Society and in Nature; the steady erosion in Sustainability; Global warming, its impact and possible causes, Evaluating future requirements for various resources; GISand applications for monitoring systems. [06 hrs]
Unit II	The importance of Civil Engineering in shaping and impacting the world;The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for Civil Engineering. [06 hrs]
Unit III	Infrastructure -Habitats, Megacities, Smart Cities, futuristic visions; Transportation, Energy generation; Water provisioning; Telecommunicationneeds); Innovations and methodologies for ensuring sustainability. [06 hrs]
Unit IV	Environment-Traditional & futuristic methods; Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control, Multi-purpose water projects, Atmospheric pollution; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability. [06 hrs]
Unit V	Built environment –Facilities management, Climate control; Energy efficientbuilt environments and LEED ratings, Recycling, Temperature/ Sound control in built environment, Security systems; Intelligent/ Smart Buildings;Aesthetics of built environment. [06 hrs]

Text Books:	
1	Ziga Turk (2014), Global Challenges and the Role of CivilEngineering, Chapter 3 in: Fischinger
2	M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht.
3	Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impactingSocial, Economic and Working Environment, 120th ASEE Annual Conference and Exposition
4	NAE Grand Challenges for Engineering (2006), Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004
Reference Book:	
1	Allen M. (2008) Cleansing the city. Ohio University Press. Athens Ohio.
2	Ashley R., Stovin V., Moore S., Hurley L., Lewis L., Saul A. (2010). London Tideway Tunnels Programme – Thames Tunnel Project Needs Report – Potential source control and SUDS applications: Land use and retrofit options

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.	Mr. Atul Gautam	Assistant Professor	JDCOEM ,Nagpur
4.	Mr. Parag Pal	Alumni	SAI Consulting Engeeneers PVT. Ltd, Bangalore

Semester	Course Code	Name of Course	L	T	P	Credits
III	CE3T002	Engineering Mathematics-III	2	1	0	3

	Prerequisites for the course
1	Understanding of complex numbers and their properties
	Basic knowledge of series and sequences
	Familiarity with basic principles of engineering

	Prior Reading Material/useful link
1.	https://www.khanacademy.org/math/algebra2/x2ec2f6f830c9fb89:complex/x2ec2f6f830c9fb89:complex-num/v/complex-number-intro
2.	https://www.youtube.com/watch?v=oDXx-cMsAJQ
3.	https://www.youtube.com/watch?v=SDQ8w0csMbY

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Describe Matrices, properties of Laplace transform and Z Transform, partial differential equation, Function of Complex Variables.
2	CO2	Illustrate the examples using Matrices, Laplace and Z Transform, Partial differential equation, Function of Complex Variables.
3	CO3	Apply the knowledge of Matrices, Laplace transform, Z Transform, Partial differential equation, Function of Complex Variables to realworld problems.
4	CO4	Analyze the question on Matrices, Laplace transform, Z Transform, Partial differential equation, Function of Complex Variables
5	CO5	Synthesize the knowledge of Matrices, Laplace transform, Z Transform, Partial differential equation, Function of Complex Variables to solve engineering problem.
6	CO6	Describe Matrices, properties of Laplace transform and Z Transform, partial differential equation, Function of Complex Variables.

Syllabus:

Course Content	
Unit I	**Matrices** Characteristics equation, Eigen values and Eigen vectors, Statement and Verification of Cayley Hamilton Theorem [without proof], Reduction to Diagonal form, Sylvester"s theorem [without proof.]. [08 hrs]
Unit II	**Laplace Transform** Definition – conditions for existence; Properties of Laplace transforms; Transforms of some special functions- periodic function, Heaviside-unit stepfunction, Introductory remarks ; Inverse transforms of some elementary functions ; Partial fraction method and inverse Laplace transforms ; Applications to find the solutions of differential equations [10 hrs]
Unit III	**Z Transform:** Definition, Convergence of Z-transform and Properties, Inverse Z-transformby Partial Fraction Method, Residue Method (Inversion Integral Method). Solutions of Difference Equations with Constant Coefficients by Z- transform. [08 hrs]
Unit IV	**Advanced Partial Differential equations:** Introduction Partial differential equation, method of separation of variables, Application of partial differential equations .(Heat equation, wave equation , Laplace Equation) [08 hrs]
Unit V	**Functions of Complex Variables:** Analytic functions; Conjugate functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form,Cauchy"s integral theorem; Bilinear transform, Cauchy"s integral formula; Residues; Cauchy"s residue theorem (All theorem without proofs) [08 hrs]

Text Books:	
1	Grewal B. S., "Higher Engineering Mathematics" KhannaPublishers, New Delhi.
2	Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New York.
3	Das H. K. and Er. VermaRajnish, "Higher Engineering Mathematics", S.Chand & Co. Pvt. Ltd.,New Delhi.
4	Dr. Singh B. B., "A course in Engineering Mathematics (Vol III)",Synergy Knowledgeware,Mumbai.
5	Ramana B. V., "Higher Engineering Mathematics", Tata McGraw-Hill Publications, New Delhi.
Reference Book:	
1	Peter O" Neil, "A Text Book of Engineering Mathematics" Thomson Asia PteLtd., Singapore.
2	Wylie C. R. & Barrett L. C., "Advanced Engineering Mathematics", Tata Mcgraw-Hill PublishingCo. Ltd., N. Delhi.
3	Dr. Singh B. B. "Integral Transforms and their Engineering Applications", SynergyKnowledgeware, Mumbai.
4	Sneddon I. N., "Integral Transforms", Tata McGraw-Hill, New York.

Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1	Ms. Leena Bhoyar	Assistant Professor	JDCOEM, Nagpur
2	Ms. Prerana Parkhi	Assistant Professor	JDCOEM, Nagpur
3	Dr. Rohit Patne	Assistant Professor	JDCOEM, Nagpur

Semester	Course Code	Name of the course	L	T	P	Credits
III	CE3T003	Building Drawing and Drafting	2	1	0	3

	Prerequisites for the course
1	Types of Structures
2	Building Elements and their types
3	Types of Masonry and other construction Materials
4	Scale Conversion

	Prior Reading Material/useful links
1.	https://archive.nptel.ac.in/courses/105/106/105106197/
2.	https://www.youtube.com/@Civil101
3.	https://www.youtube.com/watch?v=NSamrfRhoKY

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	State the basic components of building as per IS 962-1967, Building planning, anddrawing parameters as per relevant IS codes.
2	CO2	Classify the principles of different types building planning and drawing as per relevantIS code and general specifications.
3	CO3	Interpret the information of component of building, planning with respect to allparameters prescribed by I.S.
4	CO4	Examine the different types of planning of methods and suggest suitable one as perbuilding byelaws.
5	CO5	Justify methodology for development of building planning.
6	CO6	Create the building plan and drafting with all consideration of Indian standards to fulfillclient need.

Syllabus:

Course Content	
Unit I	**Introduction:** importance of Building drawing as Engineer's Language in construction & costing. Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS: 962, 1967. Free hand dimensioned sketches of various building elements and its importance in Civil Engineering [06 hrs]
Unit II	**Symbols and sign conventions**: Materials, Architectural, Structural, Electrical and Plumbing symbols. welding symbols; dimensioning standards **Building Planning:** Study of building site requirements, requirements of owner, local bye-laws and Principles of planning. Planning of residential and public buildings as per recommendation of CBRI, Roorki. [06 hrs]
Unit III	**Types of Building Drawing:** Introduction to working drawing to scale and submission drawing as per I.S. 962, from the given sketch. Designand general specifications for different components of the building including terraced and pitched roofs. Developing submission drawings to scale with location plan, site plan and block plan. Developing submission drawings for single storey residential building load bearing structure with pitch roof to scale with location plan, site plan and block plan. [08 hrs]
Unit IV	Graph paper drawing (line plans) based on various requirements for Residential, Public, Educational, Industrial Buildings and Interior aspectsas well. [04 hrs]
Unit V	**Perspective Drawing:** Two point perspective of Residential building neglecting small elementsof building such as plinth offset, Chajja [06 hrs]

Text Books:	
1	Shah, Kale, Pataki, "Building Drawing", Tata McGraw- Hill
2	Sane Y. S.," Building Design and Drawing" , Allied Book Stall, Pune
3	Jain V.K., "Automation Systems in Smart and Green Buildings", Khanna Publishers.
4	Jain V.K., "Handbook of Designing and Installation of Services in High Rise Building Complexes ,Khanna Publishers, N. Dehli, ISBN No. 978-81-7409-245-8
Reference Book:	
1	Deodhar S.V., "Building Science and Planning", Khanna Publishers, 6. Jain A.K., "The Idea ofGreen Building" Khanna Publishers, N. Delhi, ISBN No. 978-81-7409-256-4
2	SP 7- National Building Code Group 1 to 5 - B.I.S. New Delhi
3	I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings

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
III	CE3T004	Mechanics of Rigid Bodies	2	1	0	3

	Prerequisites for the course
1	Basic concepts of physics, including force, motion, work, energy, and momentum.
2	Knowledge of vectors and vector algebra.
3	Understanding of Newton's laws of motion and their applications.
4	Familiarity with trigonometry and geometry.

	Prior Reading Material/useful link
1.	https://byjus.com/physics/work-energy-power/
2	https://www.youtube.com/watch?v=giP5YGe7tjI
3	https://www.youtube.com/watch?v=g550H4e5FCY

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	State the basic fundamentals of resultant in coplanar force system, friction, structural analysis, rectilinear motion, Work energy and impulse momentum principle for particle to solve the basic engineering problems.
2	CO2	Explain the concept of force system, equilibrium, Moment ofinertia, Basic theorems to solve civil engineering problems.
3	CO3	Use concepts and parameters of mechanics to solve real time problem in engineering. CO4. Examine the force systems and determine the forces in various structural members for safe design.
4	CO4	Select the suitable methods to design various engineering componentas per the analysis CO6.Design various structural members, also correlate basic knowledge of engineering mechanics in broader way in field of Structural designing.
5	CO5	State the basic fundamentals of resultant in coplanar force system, friction, structural analysis, rectilinear motion, Work energy and impulse momentum principle for particle to solve the basic engineering problems.
6	CO6	Explain the concept of force system, equilibrium, Moment ofinertia,Basic theorems to solve civil engineering problems.

Syllabus:

Course Content	
Unit I	**Resultant of coplanar force system**: Principle of statics, Force systems, Resolution and composition of forces, Resultant of concurrent forces. Moment of a force, Couple, Varignon"s theorem, Equivalent force couple system, Resultant of parallel and general force system. Distributed forces, Centroid of plane lamina and wire bends. [10 hrs]
Unit II	**Equilibrium of Force system**: Free body diagram, Equilibrium of concurrent, parallel and general forcesina plane, Equilibrium of three forces in a plane, Types of beams, simple and compound beams, type of supports and reaction. Resultant and Equilibrium of concurrent and parallel forces in a Space. [08 hrs]
Unit III	**Analysis of structure and friction**: Two force member, Analysis of plane trusses by method of joint and method of section, cables subjected to point loads. Multi force member, Plane frames. Friction - Application of friction on inclined plane, wedges, ladders and flat belt. [08 hrs]
Unit IV	**Rectilinear motion of particles:** Kinematics- Basic concepts, Equations of motion for constant acceleration and motion under gravity, Variable acceleration, Motion curves, Relative motion and dependent motion. Kinetics- Newton"s second law of motion and its applications. [08 hrs]
Unit V	**Work energy and impulse momentum principle for particles**. Work, Power, Energy, conservative forces & Potential Energy, Conservationof energy, Work energy principle for motion of particle. Linear Impulse & Momentum, Conservation of momentum, Direct central impact and coefficient of restitution, Impulse momentum principle [08 hrs]

Text Books:	
1	Singh M., Kulkarni P., "Engineering Mechanics", PPH.
2	Bansal R. K., "A Textbook Engineering Mechanics", LaxmiPrakashan
3	Bhavikatti, "Engineering Mechanics", PHI.
Reference Book:	
1	J. L. Meriam and L. G. Kraige, "Engineering Mechanics: Dynamics", Wiley, 2011.
2	M. F. Beatty, "Principles of Engineering Mechanics", Springer Science & Business Media, 1986.

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.	Mrs. Atika Ingole	Assistant Professor	JDCOEM,Nagpur

Semester	Course Code	Name of Course	L	T	P	Credits
III	CE3T005	Energy Science and Engineering	3	0	0	3

	Prerequisites for the course
1	Basic knowledge of chemistry and environmental science.
2	Understanding of materials science and engineering.
3	Basic knowledge of civil engineering, including construction materials and structures.
4	Knowledge of engineering design and project management.

	Prior Reading Material/useful link
1.	https://study.com/academy/lesson/what-is-environmental-science-definition-and-scope-of-the-field.html
2	https://www.youtube.com/watch?v=xT9zzPR2dI0
3	https://www.youtube.com/watch?v=JZ9BkoLWdlg
4	https://onlinecourses.nptel.ac.in/noc23_ge04/preview
5	https://onlinecourses.nptel.ac.in/noc23_ch35/preview
6	https://onlinecourses.swayam2.ac.in/aic22_ge31/preview

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	List and generally explain the main sources of energy and their primary applications nationally and internationally
2	CO2	Acquire the knowledge of energy sources and scientific concepts/principles behind them.
3	CO3	Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.
4	CO4	List and describe the primary renewable energy resources and technologies.
5	CO5	Quantify energy demands and makes comparisons among energy uses, resources, and technologies.
6	CO6	Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.

Syllabus:

Course Content	
Unit I	Introduction to Energy Science: Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment. [03 hrs]
Unit II	Energy Sources: Overview of energy systems, sources, transformations, efficiency, and storage. Fossil- past, present & future, Remedies &alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energysystems; possibilities for energy storage or regeneration [04 hrs]
Unit III	Energy & Environment: Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy [05 hrs]
Unit IV	Civil Engineering Projects connected with the Energy Sources: Coal mining technologies, Oil exploration offshore platforms, Underground and under- sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems [10 hrs]
Unit V	Engineering for Energy conservation: Concept of Green Building and Green Architecture; Green building concepts; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption. [08 hrs]

Text Books:	
1	Boyle, Godfrey (2004), Renewable Energy (2nd edition). OxfordUniversity ress
2	Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), EnergySystems and Sustainability: Power for a Sustainable Future. Oxford University Press
3	Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
4	Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and EnvironmentSet: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,
Reference Book:	
1	Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy andthe Environment, 2nd Edition, John Wiley.
2	UNDP (2000), Energy and the Challenge of Sustainability, World Energyassessment.
3	E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company.

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. Parag Pal	Alumni	SAI Consulting Engeeneers PVT. Ltd, Bangalore

Semester	Course Code	Name of Course	L	T	P	Credits
III	CE3T006	Basic Geology and Geotechnical Engineering	3	0	0	3

Prerequisites for the course	
1	Soil Mechanics
2	Familiarity with geological structures and rock formations
3	Knowledge of surveying and geotechnical testing techniques
4	Understanding of environmental and sustainability issues related to mining and mineral extraction

Prior Reading Material/useful link	
1.	Arora K.R.,"SoilMechanicsandFoundationEngineering",Standardpublication2009
2.	https://www.unep.org/news-and-stories/story/indigenous-peoples-and-nature-they-protect
3.	https://www.unep.org/news-and-stories/story/how-minerals-and-metals-companies-can-help-achieve-2030-agenda-sustainable

Sr. No.	Course Outcome number	Course Outcome Statement
1	CO1	Define geology, Index properties of soil, stress distribution, earth pressure theory, subsoil investigation, and types of foundation as per suitability of soil characteristics.
2	CO2	Describe the soil behavior under different types of loading for effective foundation design.
3	CO3	Choose the relevant foundation for various soil properties and strength parameters to reduce the uncertainties in design.
4	CO4	Analyze the compaction, consolidation and stress distribution parameters.
5	CO5	Judge the modes of failure of foundation with respect to the stability of slopes for different types of soil.
6	CO6	Develop the knowledge of foundation engineering for designing various types of foundation.

Syllabus:

Course Content	
Unit I	**Mineralogy:** Classification and physical properties of Minerals,introduction to common rock-forming minerals. **Petrology:** Igneous Rocks, Sedimentary Rocks and Metamorphic Rocks (Definition, Formation & Classification) **Structural Geology**: Introduction, Internal Structure of Earth, Dip and Strikeof Beds, Folds, Joints, Faults, Unconformity, Introduction to Landslides. [08 hrs]
Unit II	**Overview of Geotechnical Engineering** Formation of Soil, Three Phase System, Physical and Index Properties of Soil and Their Determination, Soil Classification System, Consistency of Soil,Atterberg‟s Limits. **Permeability**: Darcy‟s Law, Determination of Coefficients of Permeability byLaboratory and Field Methods, One Dimensional Flow, Seepage through Soils,, Flow Nets, Piping. **Shear Strength**: Introduction, Mohr Coulomb‟s Theory, and Measurement of Shear Strength by Direct Shear Test, Triaxial Test, Unconfined Compression Test, Vane Shear Test, and Sensitivity. [08 hrs]
Unit III	**Compaction**: Theory of Compaction, Laboratory Standard and Modified Compaction Test, Method and Measurement of Field Compaction, Field Compaction Control, Compressibility. **Consolidation**: Terzaghi‟s Theory of One Dimensional Consolidation, Consolidation Test, Primary and Secondary Consolidation, Determination of Coefficient of Consolidation, Degree of Consolidation, Relevance of One Dimensional Consolidation to Field Condition, Time Factor. [08 hrs]
Unit IV	**Stress Distribution:** Stress Distribution in Soil Mass, BoussinesqueEquationand Westergaard‟s Theories. **Earth Pressure Theories** - Rankine and Coulomb, Stability of Slopes - Finite and Infinite Slopes, Pressure Bulbs. [08 hrs]
Unit V	**Sub-Surface Investigations** - Scope, Drilling Bore Holes, Sampling, Plate Load Test, SPT and CPT, ERT , GPR **Shallow foundations** - Terzaghi‟s and Meyerhoff‟s Bearing CapacityTheories, Effect of Water Table, Contact Pressure, Settlement Analysis in Sands and Clays. **Deep foundations** - Types of Piles, Dynamic and Static Formulae, Load Capacity of Piles in Sands and Clays, Pile Load Test, Negative Skin Friction. [08 hrs]

Text Books:	
1	Kasamalkar, B.J., "Foundation Engineering" , Pittsburgh vintageGrand Prix.
2	Murthy V.N.S., "Soil Mechanics and Foundation Engineering" , CRC Press2002.
3	Arora K.R., "Soil Mechanics and Foundation Engineering" , Standard publication 2009
4	Punmia B. C., "Soil Mechanics and Foundation Engineering", Laxmipublication.
Reference Book:	
1	Nayak N.V., "Foundation Design Manual", DhanpatRai and Sons.

2	Brahma S.P., "Foundation Engineering", Tata McGraw-Hill 5th Edition.
3	Bowles J.E., "Foundation analysis & Design" McGraw-Hill Higher Education 5th edition.
Useful Link:	
1.	https://onlinecourses.nptel.ac.in/noc20_ce25/preview

Contribution for Syllabus Design:

Sr. No.	Name of Person	Designation	Organization
1.	Dr. Kshitija Kadam	Professor	GCOE,Nagpur
2.	Mr. Atul Gautam	Assistant Professor	JDCOEM,Nagpur
3.	Mr. Parag Pal	Alumni	SAI Consulting Engeeneers PVT. Ltd, Bangalore

III SEMESTER (Laboratory)

Semester	Course Code	Name of Course	L	T	P	Credits
III	CE3L001	Building Drawing and Drafting	0	0	4	2

Sr. No.	Learning Outcome number	Learning Outcome Statement
1	LO1	Demonstrate the basic symbols, types of lines and material symbols to develop submission drawing as per building byelaws.
2	LO2	Examine the development plan before submission for approval by competent authority.
3	LO3	Justify submission drawing of residential building as well as public building asper norms.
4	LO4	Assemble all construction details in submission drawing as per the specifications as per relevant IS code.

Syllabus:

Sr. No.	Name of Experiments
1	Sketches of various types of lines, Lettering and material symbols on sketch book.
2	Graph paper design (line plans) based on various requirements for Hospital / Hostel buildings.
3	Graph paper design (line plans) based on various requirements for shopping complex /primary school building.
4	Development of plans for Single Line residential building.
5	Development of plans for Double Line(2D) residential building.
6	Developing submission drawings for single storey residential building flat roof frame structure with access to terrace with location plan, site plan and block plan.
7	Two point perspective view of the various objects.
8	Two point perspective of the single storied Residential building neglecting small building elements. (Flat terraced roof)
9	Graph paper design (line plans) based on various requirements for Bank Building.
10	Graph paper design (line plans) based on various requirements for Post office Building.
11	Developing submission drawings for single storey residential building flat roof Load bearing structure with site plan.
12	Developing submission drawings of 2BHK for single storey residential building flat roof Load bearing structure with site plan and calculate carpet area.
13	Developing submission drawings of 3BHK for single storey residential building flat roof Load bearing structure with site plan and calculate carpet area.
14	Graph paper design (line plans) based on various requirements for i) Junior college. ii) Bank Building iii) Post office Building iv) Market building.
15	Development of Residential plan, elevation & Section by Auto CAD

Semester	Course Code	Name of Course	L	T	P	Credits
III	CE3L002	Mechanics of Rigid Bodies Lab	0	0	2	1

Sr. No.	Learning Outcome number	Learning Outcome Statement
1	LO1	Demonstrate the basic symbols, types of lines and material symbols to develop submission drawing as per building byelaws.
2	LO2	Examine the development plan before submission for approval by competent authority.
3	LO3	Justify submission drawing of residential building as well as public building asper norms.
4	LO4	Assemble all construction details in submission drawing as per the specifications as per relevant IS code.

Syllabus:

Sr. No.	Name of Experiments
1	Verification of law of parallelogram of forces/ polygon of forces.
2	Support reaction of simple / compound beams.
3	Determination of Coefficient of friction on inclined plane.
4	Determination of Coefficient of coil friction.
5	To determine forces in Space Force System.
6	Determination of mass moment of inertia of fly wheel.
7	Determination of gravitational acceleration by compound pendulum.
8	Determination of velocity ratio, law of machine of simple screw jack.
9	Determination of velocity ratio, law of machine of differential wheel axle.
10	Determination of velocity ratio, law of machine of worm and worm wheel.
11	Determination of velocity ratio, law of machine of single purchase crab.
12	Determination of velocity ratio, law of machine of double purchase crab.

Semester	Course Code	Name of Course	L	T	P	Credits
III	CE3L003	Basic Geology and Geotechnical Engineering Lab	0	0	2	1

Sr. No.	Learning Outcome number	Learning Outcome Statement
1	LO1	Illustrate all geological properties of rocks and minerals, soil index properties, sub soil investigation for foundation design as per need.
2	LO2	Experiment soil index properties, sub soil investigation and analyze the results obtained by different soil test as per relevant I.S code.
3	LO3	Judge the experimental results of soil index properties, sub soil investigations shear strength parameters and coefficients for field conditions.
4	LO4	Design the modern technology for foundation design in the field of geotechnical engineering to cater the scarcity of optimumdesign solutions.

Syllabus:

Sr. No.	Name of Experiments
1	Megascopic and microscopic identification of rocks and minerals.
2	Determination of Moisture Content and Specific Gravity of coarse- and fine-grained soil.
3	Grain size distribution of the soil by Sieve Analysis. (Mechanical Sieve Analysis or Wet Sieve Analysis).
4	Determination of Atterberg's Limits of a soil.
5	Determination of Field Density of soil by Core Cutter Method or Sand Replacement Method.
6	Determination of the coefficient of permeability of a soil by constant Head Apparatus and Variable Head Apparatus.
7	Determination of unconfined compressive strength of a cohesive soil.
8	One dimensional consolidation test.
9	Determination of Optimum moisture content and maximum dry density of soil by Proctor Compaction Test
10	Determination of shear strength parameters of soils under Triaxial loading conditions.
11	Improvement Of Bearing Capacity Of Sandy Soil By Grouting
12	Effect of Blast Furnace Slag on soil-cement Stabilization
13	Importance of Soil Stabilization before starting any Project
14	Role of Geo Synthetic in the Improvement of Strength of Soil
15	Slope stabilization Problem analysis by using software.

Semester	Course Code	Name of Course	L	T	P	Credits
III	CE3T007	Innovation and Entrepreneurship Development	2	0	0	AU

Course Outcomes:

This subject aims at giving practical exposure to students and to provide opportunities for acquiring knowledge regarding manufacturing and service industries/organizations and to acquaint them with industrial culture. Upon completion of this course, students will be able to describe the usage of different technologies/tools/concepts related to Design process, operation of various machines, mechanical drives, manufacturing processes, machining processes, various process equipment, production techniques, quality control, maintenance practices, automation in industries, management etc.

At the end of the course students will be able to

1. Identify and validate of ideas.
2. Remember Patent registration of Innovation.
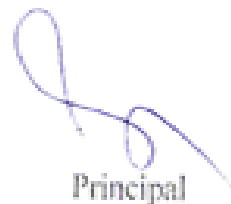3. Understand roles and responsibilities of Entrepreneurship

Syllabus:

Course Content	
Unit I	**Innovation:** Concept of creativity, innovation, invention, discovery. Methods for development of creativity, convergent & divergent thinking etc. Introduction to Intellectual Property Rights (IPR), Patent and laws relatedto patents. [06 hrs]
Unit II	**Entrepreneurship:** Concept of entrepreneurship, its relations in economic developments, Eventuation of concept of entrepreneur, characteristics of an Entrepreneur, Types of entrepreneurs, Qualities of entrepreneur, Factors affecting growthof entrepreneurship [06 hrs]
Unit III	**Role of Entrepreneurial Bodies:** Theory of achievement, motivation, Medelland"s. Experiment, Women entrepreneurship, Role of SSI, its advantages & limitations, policiesgoverning small scale industries, Procedure to set up small scale industrial unit, Advantages and limitations of SSI. [06 hrs]
Unit IV	**Role of Entrepreneurial Support:** Factors governing project selection, Market survey, Preparation of projectreport. Financial, technical & market analysis of project. Entrepreneurial support systems, Role of consultancy organization like, District Industrial Centre, State Industrial Development Corporation, Financial institution, Latest SSI schemes of DIC (to be confirmed from DIC from time to time. [06 hrs]

Text Books:	
1	Entrepreneurship Development, S. S. Khanka, S. Chand Publishers.

Reference Book:	
1	Creativity Innovation & Entrepreneurship, Zechariah James Blanchard,Needle Rat Business Publishers

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