**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**

# Course Structure & Evaluation Scheme

## VIII 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 | PEC | CE8TE01 | Professional Elective-VI | 3 | 0 | - | 20 | 20 | 60 | 100 | 3 |
| 2 | OEC | CEOEC4 | Open Elective-IV | 4 | 0 | - | 20 | 20 | 60 | 100 | 4 |
| 3 | PROJECT | CE8P001 | Project-2 | 0 | 0 | 4 | 50 | 0 | 50 | 100 | 3 |
| **OR** | | | | | | | | | | | |
| 1 | PROJECT | CE8F002 | Internship/FieldTraining | 0 | 0 | 0 | 225 | - | 75 | 300 | 10 |
| | | | | **7** | **0** | **4** | | | | | **10** |

**Professional Elective-VI**

| Sr. No. | Category of Subject | Course Code | Course Name |
|---|---|---|---|
| 1. | PEC | CE8TE01A | Planning and Design of Airports |
| 2. | PEC | CE8TE01B | Infrastructure Planning and Management |
| 3. | PEC | CE8TE01C | Environmental Principles and Laws |
| 4. | PEC | CE8TE02D | Advanced Structural Analysis |
| 6. | PEC | CE8TE02F | Disaster Management |

**Open Elective-IV**

| | | | |
|---|---|---|---|
| 1. | OEC | CEOEC4A | Ergonomics in Civil Engineering |
| 2. | OEC | CEOEC4B | Metro System and Engineering |

| Semester | Course Code | Name of Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| VIII | CE8TE01A | Professional Elective VI<br>Planning and Design of Airports | 3 | 0 | - | 3 |

| Prerequisites for the course | |
|---|---|
| 1 | Basic understanding of aviation industry and air transportation system |
| 2 | Knowledge of civil engineering principles and practices |
| 3 | Understanding of airport operations and management |
| 4 | Familiarity with airport design standards and regulations |

| Prior Reading Material/useful link | |
|---|---|
| 1 | Airport Planning: https://archive.nptel.ac.in/courses/105/107/105107123/ |
| 2 | Aircraft Characteristics: https://onlinecourses.nptel.ac.in/noc22_ae14/preview |
| 3 | Airport Design: https://archive.nptel.ac.in/courses/105/107/105107123/ |
| 4 | Structural Design of Airport Pavements: https://nptel.ac.in/courses/105104098 |
| 5 | Airport Lighting: https://archive.nptel.ac.in/courses/105/107/105107123/ |

| Sr. No. | Course Outcome number | Course Outcome Statement |
|---|---|---|
| 1 | CO1 | Define the scope of planning and orientation of airport elements. |
| 2 | CO2 | Explain the various components of the airport, grouped by airside, terminal, and groundside facilities. |
| 3 | CO3 | Identify the concepts of demand forecasting, the aircraft characteristics impact on airport design and its influence upon the surrounding environment. |
| 4 | CO4 | Examine the practical solution to planning and designing of an airport and airport pavement. |
| 5 | CO5 | Judge the requirements to satisfy complete site investigation, selection and preliminary design for a small general aviation airport understanding its relationship to local economic development. |
| 6 | CO6 | Develop professional skills relating to airport planning and design. |

**Syllabus:**

| Course Content | |
|---|---|
| Unit I | Airport Planning**:** The Nature of Civil Aviation and Airports, Introduction, Commercial Service Aviation, General Aviation, Civil Aviation Reports, Historical Review of the Legislative Role in Aviation, State Roles inAviation and Airports, Aviation Organizations and their functions. [05 Hrs.] |
| Unit II | Aircraft Characteristics Related to Airport Design: Dimensional standards, landing gear configurations, aircraft weight, Atmospheric conditions affecting Aircraft performance, Aircraft performance characteristics.<br>Air Traffic Management, Airport Planning Studies, Forecasting for Airport Planning. [07 Hrs.] |
| Unit III | Airport Design: Geometric Design of the Airfield; Airport design standards, Airport classification, Runways, Runway configurations, Taxiways and Taxi lanes, Aprons, Control tower visibility requirements. [08 Hrs.] |
| Unit IV | Structural Design of Airport Pavements: Introduction, Soil investigation and evaluation, effect of frost on soil strength, subgrade stabilization, Design of flexible pavement, Design of rigid pavement. [08 Hrs.] |
| Unit V | Airport Lighting, Marking, and Signage; Airport Drainage; Planning and Design of the Terminal Area.<br>Special Topics in Airport Planning and Design: Airport Security Planning, Airport Airside Capacity and Delay. Finance Strategies for Airport Planning, Environmental Planning, Heliports. [08 Hrs.] |

| Text Books: | |
|---|---|
| 1 | Airport Planning and Designing by S.K. Khanna, M.G. Arora. |
| 2 | Robert Horonjeff, Francis Mc Kelvey, William Sproule and Seth Young, "Planning and Design of Airports" 5th Edition, 2010. |
| Reference Book: | |
| 1 | Norman J. Ashford, Saleh Mumayiz and Paul H. Wright, "Planning, Design and Development of 21st Century Airports", 4th Edition, John Wiley &Sons, 2011 |

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 |
|---|---|---|---|---|---|---|
| VIII | CE8TE01B | Professional Elective VI Infrastructure Planning and Management | 3 | 0 | - | 3 |

| Prerequisites for the course | |
|---|---|
| 1 | Basic understanding of the concept of infrastructure and its various sectors such as power, water supply, transportation, telecommunications, and urban/rural infrastructure. |
| 2 | Knowledge of the infrastructure project lifecycle and the stages involved in successful infrastructure planning and implementation. |
| 3 | Understanding of the role and importance of infrastructure in economic development. |
| 4 | Familiarity with the organizations and players involved in infrastructure development and their functions. |

| Prior Reading Material/useful link | |
|---|---|
| 1 | https://www.blackridgeresearch.com/blog/what-is-infrastructure-and-types-of-infrastructure-projects-for-economic-development |
| 2 | https://egyankosh.ac.in/bitstream/123456789/39255/1/Unit-3.pdf |
| 3 | https://www.iea.org/reports/digitalisation-and-energy |

| Sr. No. | Course Outcome number | Course Outcome Statement |
|---|---|---|
| 1 | CO1 | Define the basic concepts, involvements, challenges and strategies related to Infrastructure Projects |
| 2 | CO2 | Explain the role of private sector and technological aspect in infrastructure growth, drawing reference from historical perspective. |
| 3 | CO3 | Identify various strategies and challenges faced for successful Infrastructure Project planning and implementation. |
| 4 | CO4 | Examine those strategies and challenges faced for successful Infrastructure Project implementation from sustainable point of view. |
| 5 | CO5 | Decide integrated framework for infrastructure planning and management. |
| 6 | CO6 | Develop infrastructure modeling and Life Cycle Analysis techniques for appropriate infrastructure planning and management. |

**Syllabus:**

| Course Content | |
|---|---|
| Unit I | An overview of Basic Concepts Related to Infrastructure: Introduction to Infrastructure, an overview of the Power Sector in India. An Overview of the Water Supply and Sanitation Sector, the Road, Rail, Air and Port Transportation Sectors, Telecommunications Sector, Urban Infrastructure Rural Infrastructure, Introduction to Special Economic Zones, Organizations and Players in the field of Infrastructure, The Stages of an Infrastructure Project Lifecycle, an overview of Infrastructure Project Finance. [05 Hrs] |
| Unit II | Private Involvement in Infrastructure: A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Challenges in Privatization, Privatization of Road Transportation Infrastructure in India. [07 Hrs] |
| Unit III | Challenges to Successful Infrastructure Planning and Implementation: Mapping and Facing the Landscape of Risks in Infrastructure Projects, Economic and Demand Risks, Socio-Environmental Risks, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure. [08 Hrs] |
| Unit IV | Strategies for Successful Infrastructure Project Implementation: Risk Management Framework for Infrastructure Projects, Shaping the Planning Phase of Infrastructure Projects to mitigate risks, Introduction to Fair Process and Negotiation, Negotiating with multiple Stakeholders on Infrastructure Projects, Sustainable Development of Infrastructure, [08 Hrs] |
| Unit V | Information Technology and Systems for Successful Infrastructure Management, Innovative Design and Maintenance of Infrastructure Facilities, Infrastructure Modeling and Life Cycle Analysis Techniques, Capacity Building and Improving the Governments Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions. [08 Hrs] |

| Text Books: | |
|---|---|
| 1 | Grigg, Neil, Infrastructure engineering and management, Wiley, (1988). |
| 2 | Hudson, Haas, Uddin, Infrastructure management: integrating design, construction, maintenance, rehabilitation, and renovation, McGraw Hill, (1997). |
| Reference Book: | |
| 1 | World Development Report 1994: Infrastructure for Development (1994). |
| 2 | Zimmerman, K. and F. Botelho, "Pavement Management Trends in the United States," 1st European Pavement Management Systems Conference, Budapest, September (2000). |

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. Kamlesh K. Meshran | Assistant Professor | JDCOEM, Nagpur |

| Semester | Course Code | Name of Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| VIII | CE8TE02C | Professional Elective VI<br>Environmental Principles and Laws | 3 | 0 | - | 3 |

| Prerequisites for the course | |
|---|---|
| 1 | Basic understanding of legal concepts and terminologies |
| 2 | Knowledge of Indian legal system and judiciary |
| 3 | Basic knowledge of the Indian Constitution |
| 4 | Understanding of environmental issues and challenges |

| Prior Reading Material/useful link | |
|---|---|
| 1 | https://www.youtube.com/watch?v=aNjslubyYdI |
| 2 | https://byjus.com/free-ias-prep/constitution-of-india-an-overview/ |
| 3 | https://www.youtube.com/watch?v=jUEw1f7up2o |

| Sr. No. | Course Outcome number | Course Outcome Statement |
|---|---|---|
| 1 | CO1 | Acquire the knowledge about role of laws, policies and institutionsin the conservation and management of natural resources. |
| 2 | CO2 | Interpret various laws on hazards causing impacts on environment. |
| 3 | CO3 | Build the environment reducing the impacts of activities and considering laws and acts. |
| 4 | CO4 | Take inference from the laws of environment and acts. |
| 5 | CO5 | Evaluate the role of law and policy in conservation and management of natural resources and prevention of pollution. |
| 6 | CO6 | Develop the region by constructing civil engineering works with reference to the environmental laws, policy and referring to the legal facts. |

**Syllabus:**

| Course Content | |
|---|---|
| Unit I | **Basic Concepts in Environmental Law**: An introduction to the legal system; Constitution, Acts, Rules, Regulations; Indian Judiciary, Doctrine of precedents, judicial review. General principles in Environmental law: Precautionary principle; Polluter pays principle; Sustainable development. [08 Hrs] |
| Unit II | **Forest, Wildlife and Biodiversity related laws**: Evolution and Jurisprudenceof Forest and Wildlife laws; Colonial forest policies; Forest policies after independence Statutory framework on Forests, Wildlife and Biodiversity: IFA, 1927 [06 Hrs] |
| Unit III | **Air, Water and Marine Laws:** National Water Policy and some state policies Laws relating to prevention of pollution, access and management of water and institutional mechanism: Water Act, 1974; Water Cess Act, 1977, EPA, 1986. Pollution Control Boards Ground water and law Judicial remedies and procedures Marine laws of India; Coastal zone regulations. Legal frameworkon Air Pollution: Air Act,1981; EPA, 1986 [06 Hrs] |
| Unit IV | **Hazardous Substances and Activities** : Legal framework: EPA and rulesmade thereunder; PLI Act,199 Principles of strict and absolute liability [06 Hrs] |
| Unit V | **International Environmental law** : An introduction to International law; sources of international law; law of treaties; signature, ratification Evolution of international environmental law: Customary principles; Common but differentiated responsibility [06 Hrs] |

| Text Books: | |
|---|---|
| 1 | Birnie P. (2009) et al., International Law and the Environment, 3rd ed., Oxford. |
| 2 | Desai A. (2002) Environmental Jurisprudence, 2nd ed., Modern Law House, Allahabad. |
| 3 | Gadgil M. and Guha R. (1995) Ecology and Equity, Oxford, New Delhi. |
| Reference Book: | |
| 1 | Gadgil M. and Guha R. (1997) This Fissured Land, Oxford, New Delhi. |
| 2 | Guha R. (2000) Environmentalism: A Global History, Oxford, New Delhi. |

Contribution for Syllabus Design:

| Sr. No. | Name of Person | Designation | Organization |
|---|---|---|---|
| 1. | Dr. Rahul Ralegaonkar | Professor | VNIT, Nagpur |
| 2. | Mr. Nilesh Pal | Assistant professor | JDCOEM, Nagpur |
| 3. | Mr. Gaurav Rangari | Assistant professor | JDCOEM, Nagpur |

| Semester | Course Code | Name of Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| VIII | CE8TE02D | Professional Elective VI<br>Advanced Structural Analysis | 3 | 0 | - | 3 |

| Prerequisites for the course | |
|---|---|
| **1** | Understanding of basic principles of structural analysis and design. |
| **2** | Knowledge of mathematics including calculus, differential equations, and linear algebra. |
| **3** | Familiarity with mechanics of materials and strength of materials. |
| **4** | Knowledge of structural elements such as beams, columns, and frames. |
| **5** | Familiarity with various types of loads acting on structures including static, dynamic, and seismic loads. |

| Prior Reading Material/useful link | |
|---|---|
| **1** | https://www.youtube.com/watch?v=UvqO2JfIcsw |
| **2** | https://www.youtube.com/watch?v=H1sWkfHb2Hg |
| **3** | https://structuralengineeringbasics.com/types-of-loads-on-structures/ |

| Sr. No. | Course Outcome number | Course Outcome Statement |
|---|---|---|
| 1 | CO1 | Recall the various advanced methods of structural analysis. |
| 2 | CO2 | Identify the behavior of structural components or structures using methods of analysis under different loading. |
| 3 | CO3 | Interpret the application of analysis methods according to the structural component. |
| 4 | CO4 | Analyze the structural component and structures adopting advanced structural analysis methods. |
| 5 | CO5 | Evaluate the structural behavior from the analysis. |
| 6 | CO6 | Formulate the structural component based on its analysis. |

**Syllabus:**

| Course Content | |
|---|---|
| Unit I | Approximate methods of analysis of multi-bay multi-storey Frames by –<br>(a) Cantilever method, (b) Portal method & (c) Factor method.<br>Analysis of Beam Curved in Plan (Statically Determine Beams Only) Introduction, circular beam loaded uniformly and supported on symmetrically placed columns, semicircular Beams, Varandah circular beams. Infinite & semi-infinite beams resting on elastic foundations. [10 Hrs] |
| Unit II | Cantilever moment distribution method, application to rigid jointed plane frames. Vierndeel girders - analysis for vertical sway cases only. [08 Hrs] |
| Unit III | Advanced Matrix Method of Analysis For Plane Frames, Analysis of Symmetrical & Unsymmetrical plane frames Effects of Shear deformation. Symmetry, Anti-symmetry conditions for solving symmetric frames. [08 Hrs] |
| Unit IV | Analysis of columns loaded laterally.<br>Structural response to earthquake, analysis of multistoried frames by I.S.code provisions. [06 Hrs] |
| Unit V | Introduction to theory of elasticity - (treatment in Cartesian coordinates), state of stress at a point, stress –equilibrium equations, strain-components, stress - strain relations, generalized Hooke's law, strain plane stress and plane conditions, stress and compatibility for 2D. [06 Hrs] |

| Text Books: | |
|---|---|
| 1 | Norris, Wilbur, Elementary Structural Analysis |
| 2 | Timoshenko & Goodier, Theory of Elasticity |
| 3 | Jaikrishna, Chandrashekharan, Element of Earthquake Engineering, Sarita Publication, Meerut (U.P.) |
| Reference Book: | |
| 1 | Matrix Method of Structural Analysis - Gere and Weaver |
| 2 | Structural Dynamics- Clough &Penzin |

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 | JDCOEM, Nagpur |
| 4. | Ms. Tinu Khandale | Assistant Professor | JDCOEM, Nagpur |

| Semester | Course Code | Name of Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| VIII | CE8TE02F | Professional Elective VI<br>Disaster Management | 3 | 0 | - | 3 |

| Prerequisites for the course | |
|---|---|
| 1 | Basic knowledge of natural hazards such as earthquakes, floods, landslides, cyclones, and droughts. |
| 2 | Understanding of the principles of risk and vulnerability in disasters. |
| 3 | Knowledge of the different types of disasters, including natural and man-made disasters. |
| 4 | Basic knowledge of the geological and geographical features of the Indian subcontinent, including plate tectonics, seismic zones, and climatic conditions. |

| Prior Reading Material/useful link | |
|---|---|
| 1 | https://www.preventionweb.net/understanding-disaster-risk/component-risk/hazard |
| 2 | https://public.wmo.int/en/our-mandate/focus-areas/natural-hazards-and-disaster-risk-reduction |
| 3 | https://chhattisgarh.pscnotes.com/prelims-notes/environment/natural-hazards-floods-droughts-cyclones-landslides/ |

| Sr. No. | Course Outcome number | Course Outcome Statement |
|---|---|---|
| 1 | CO1 | Recall basic conceptual understanding of disasters. |
| 2 | CO2 | Illustrate the approaches of Disaster Management. |
| 3 | CO3 | Build skills to respond to disaster. |
| 4 | CO4 | Analyze disaster management techniques for its application. |
| 5 | CO5 | Discuss the social issues of the environment with associated acts. |
| 6 | CO6 | Predict the Building design and construction in highly seismic zones. |

**Syllabus:**

| Course Content | |
|---|---|
| Unit I | Definition and types of disaster: Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disasters. [08 Hrs] |
| Unit II | Study of Important disasters: Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements case studies of disasters in Sikkim. [06 Hrs] |
| Unit III | Mitigation and Management techniques of Disaster: Basic principles of disasters management, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management, Early Warming Systems, Building design and construction in highly seismic zones, retrofitting of buildings. [06 Hrs] |
| Unit IV | Training, awareness program and project on disaster management: Training and drills for disaster preparedness, Awareness generation program, Usages of GIS and Remote sensing techniques in disaster management, Mini project on disaster risk assessment and preparedness for disasters with reference to disasters in Sikkim and its surrounding areas. [06 Hrs] |
| Unit V | Mini project on disaster risk assessment and preparedness for disasters with reference to disasters in Sikkim and its surrounding areas [06 Hrs] |

| Text Books: | |
|---|---|
| 1 | Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012). |
| 2 | Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman. |
| 3 | Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi. |
| Reference Book: | |
| 1 | Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi. |
| 2 | Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD. |

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 |

| Semester | Course Code | Name of Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| VIII | CE8O002A | Open Elective IV<br>Ergonomics in Civil Engineering | 4 | 0 | - | 4 |

| Prerequisites for the course | |
|---|---|
| **1** | Basic knowledge of human anatomy and physiology |
| **2** | Understanding of the physical and mental demands of various civil engineering tasks |
| **3** | Knowledge of the principles of ergonomics and its application in engineering design |
| **4** | Understanding of the various factors that can affect human performance and productivity |
| **5** | Knowledge of design factors that influence the work environment, such as lighting, temperature, and noise |

| Prior Reading Material/useful link | |
|---|---|
| **1** | https://www.physio-pedia.com/Ergonomics |
| **2** | https://ergo-plus.com/workplace-ergonomics-benefits/ |
| **3** | https://ehs.ucsf.edu/ergonomics-human-factors-program |

| Sr. No. | Course Outcome number | Course Outcome Statement |
|---|---|---|
| 1 | CO1 | Acquire the knowledge of the elements of Ergonomics, practical ergonomics, workload estimation and its design parameters. |
| 2 | CO2 | Relate the study of ergonomics in civil engineering operations. |
| 3 | CO3 | Organize the procedures to reduce human efforts. |
| 4 | CO4 | Analyze the human work load in civil engineering for different practices considering the practical ergonomics. |
| 5 | CO5 | Appraise the elements of ergonomics ameliorating procedural practices. |
| 6 | CO6 | Develop a system encapsulating aspects of ergonomics to ease human efforts. |

**Syllabus:**

| Course Content | |
|---|---|
| Unit I | Elements of Ergonomics practice: The physical basis of man's perception of his environment, The human body. [06 Hrs] |
| Unit II | Practical Ergonomics: Design Factors, Environmental factors, Organizational factors. [06 Hrs] |
| Unit III | Estimation of Human work load in various civil engineering aspects: Mixing concrete ingredients, manual material handling, brickwork. [06 Hrs] |
| Unit IV | Estimation of Human work load in various civil engineering aspects: binding of stirrups, plastering of walls, construction of scaffolding. [06 Hrs] |
| Unit V | Design of Onsite-workstations for (i) stirrups making (ii) fabrication of centering of columns, plinth beams, slabs. [06 Hrs] |

| Text Books: | |
|---|---|
| 1 | Man in his working environment, by Hywel Murrel. |
| Reference Book: | |
| 1 | Ergonomics design for people at work, by Kodak. |

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| 1. | Dr. Kshitija Kadam | Professor | GCOE, Nagpur |
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| 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 |
|---|---|---|---|---|---|---|
| VIII | CE8O002B | Open Elective IV<br>Elements of Earthquake | 4 | 0 | - | 4 |

| Prerequisites for the course | |
|---|---|
| **1** | Structural Analysis |
| **2** | Basic Geology and Geotechnical Engineering |

| Prior Reading Material/useful link | |
|---|---|
| **1** | Structural Analysis - I (English, Paperback, Bhavikatti S. S.) |
| **2** | Geology for Geotechnical Engineers Paperback by J. C. Harvey |

| Sr. No. | Course Outcome number | Course Outcome Statement |
|---|---|---|
| 1 | CO1 | Define the earth interior, seismic parameters, earthquake resistant structures. |
| 2 | CO2 | Interpret the behavior of ground motions and civil engineering structures during earthquake. |
| 3 | CO3 | Apply the knowledge of seismology for improvement of civil engineering structure during earthquake. |
| 4 | CO4 | Compare the structural behavior according to the various seismic parameters |
| 5 | CO5 | Explain the earth geology, quantification of earthquake, its effect on civil engineering structures and their repairs and rehabilitation. |
| 6 | CO6 | Discuss the earth's interior, seismology and its application in civil engineering structures. |

**Syllabus:**

| Course Content | |
|---|---|
| Unit I | Introduction to Earthquakes: Geology of Earth, Configuration of Tectonic Plates in a Globe, Behavior of Plates, Their Motion and Effects, Causes of Earthquake and their Characteristics, Earthquake Parameters, Magnitudes, Intensity. [06 Hrs] |
| Unit II | Seismic Waves, Recording of Earthquakes, Analysis and Interpretation of Earthquake Data, Determination of Magnitude, Location of Epicenter, Focal Depth. [06 Hrs] |
| Unit III | Seismicity of the World, History of Earthquakes in India and Abroad, Case Studies of Effects of Earthquakes, Causes and Sources of Earthquake Damage.[06 Hrs] |
| Unit IV | Non-Engineered Earthquake Resistant Structures, Load Bearing Structures, Masonry Structures, Seismic Zoning of India (IS 1893:2002 Part I), Seismic Coefficients for Different Zones, Definitions, Irregularities in Buildings, Consequences of Irregularities. [06 Hrs] |
| Unit V | Strengthening, Rehabilitation and Retrofitting of Earthquake Damaged Structures, Earthquake Disaster Management, Mitigation and Social Aspects of Earthquakes, Lessons from Past Earthquake: - Study of Damages Caused Due to Past Earthquake and Remedial Measures. [06 Hrs] |

| Text Books: | |
|---|---|
| 1 | Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007 |
| 2 | Amita Sinvhal; Understanding Earthquake Disasters, Tata McGraw Hill |
| Reference Book: | |
| 1 | P. N. Agraval; Engineering Seismology Oxford & IBH Publishing |
| 2 | C.V.R.Murty; Earthquake Tips National Information Centre of Earthquake Engineering IIT Kanpur |

Contribution for Syllabus Design:

| Sr. No. | Name of Person | Designation | Organization |
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| 1. | Dr. Kshitija Kadam | Professor | GCOE, Nagpur |
| 2. | Dr. Prashant Pawade | Professor | GHRCOE |
| 3. | Mr. Atul Gautam | Assistant Professor | JDCOEM,Nagpur |
| 4. | Ms. Tinu Khandale | Assistant Professor | JDCOEM,Nagpur |

| Semester | Course Code | Name of Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| VIII | CE8O002C | Open Elective IV<br>Metro System and Engineering | 4 | 0 | - | 4 |

| Prerequisites for the course | |
|---|---|
| **1** | Sustainable transportation systems and green infrastructure |
| **2** | Human factors and ergonomics in transportation design |
| **3** | Data analytics and visualization for transportation planning |
| **4** | Cyber security and data privacy in transportation systems |

| Prior Reading Material/useful link | |
|---|---|
| **1** | https://www.youtube.com/watch?v=aswfxJ2H0dA&list=PLLy_2iUCG87A6dwmEFv_ET4Bb0wAVcUrx |
| **2** | https://www.youtube.com/watch?v=qG_clin0Tis&list=PL819F5B524B56D0D3 |
| **3** | https://www.youtube.com/watch?v=q4pyaVZjqk0 |
| **4** | https://www.youtube.com/watch?v=-dNsW2AOGYY&list=PLyqSpQzTE6M-q0Xgn0icEHvUS7WQxvenv |

| Sr. No. | Course Outcome number | Course Outcome Statement |
|---|---|---|
| 1 | CO1 | Acquire the knowledge of metro system and various engineering operations involved in it. |
| 2 | CO2 | Explain the various operations working simultaneously in metro system and planning. |
| 3 | CO3 | Apply the knowledge of various engineering operations in metro system. |
| 4 | CO4 | Distinguish the role of different operations in metro system. |
| 5 | CO5 | Perceive the knowledge of safety and control over the engineering operations. |
| 6 | CO6 | Plan the metro system including all engineering operations. |

**Syllabus:**

| Course Content | |
|---|---|
| Unit I | General: Overview of Metro Systems; Need for Metros, Routing Studies, BasicPlanning and Financial.<br>Civil Engineering: Overview and Construction Methods For: Elevated and Underground Stations; Viaduct Spans and Bridges; Underground Tunnels;Depots; Commercial and Service Buildings. [06 Hrs] |
| Unit II | Initial Surveys & Investigations; Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic Integration, Multimodal Transfers and Pedestrian Facilities; Environmental and Social Safeguards; Track Systems-Permanent Way. Facilities Management<br>[06 Hrs] |
| Unit III | Electronics and Communication Engineering: Signaling Systems; Automatic Fare Collection; Operation Control Centre; SCADA And Other Control Systems;Platform Screen Doors. [06 Hrs] |
| Unit IV | Mechanical & TV + AC: Rolling Stock, Vehicle Dynamics and Structure; TunnelVentilation Systems; Air Conditioning for Stations and Buildings; Fire Control Systems; Lifts and Escalators [06 Hrs] |
| Unit V | Electrical: OHE, Traction Power; Substations- TSS And ASS; Power SCADA;Standby and Back-Up Systems; Green Buildings, Carbon Credits and Clear Air Mechanics. [06 Hrs] |

| Text Books: | |
|---|---|
| 1 | Manual of specification and standard of Elevated Mass Rapid Transit System. |
| 2 | Code for Practice for Project Management for Construction and Development, 5th Edition Wiley Blackwell by CIOB (The Chartered Institute of Building) |
| Reference Book: | |
| 1 | SP 7: 2016, National Building Code of India 2016 (NBC 2016) |

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 K. Meshram | Assistant Professor | JDCOEM,Nagpur |

**(Laboratory)**

| Semester | Course Code | Name of Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| | CE8P001 | Project 2 | 0 | 0 | 4 | 3 |

**Syllabus:**

| Course Content | |
|---|---|
| Unit I | Every student has to undertake a project of professional interest. |
| Unit II | The project may be related to a theoretical analysis, an experimental investigation, a proto-type design, a new correlation and analysis of data, fabrication and setup of new equipment. |
| Unit III | The students will carry out the Project work in a group which is finalized in VIII semester and submit a project report at the end of the semester. |
| Unit IV | Each group shall deliver seminar/seminars on the project work done during the semester. |

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 |
|---|---|---|---|---|---|---|
| VIII | CE8P002 | Internship/Field Training | 0 | 0 | 0 | 10 |

**Syllabus:**

Course Content:

Students can undertake six months industry project during the internship. This scheme will provide students to undergo internship with stream majors at industry / well known academicinstitutions /R&D Laboratory premises and earn real world exposure.

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 |
| 5. | Mr. Atul Gautam | Assistant Professor | JDCOEM,Nagpur |

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

Principal

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