DEPARTMENT OF CIVIL ENGINEERING

NPTEL EQUIVALENT COURSES FOR HONORS DEGREE-2023-2024

NPTEL EQUIVALENT COURSES

S.No.	Course ID	Course Name	Course syllabus
1	noc23-ce106	Earth Sciences for Civil Engineering (Hindi)	Week 1: Module 1 : Introduction to Geosciences in Civil Engineering Module 2 : Plate Tectonics and Continental Drift Module 3 : Rock-forming Minerals and their properties Week 2: Module 1 : Rock-forming Minerals and their properties Module 2 : Rock types and their properties Week 3: Module 1 : Seismology and the internal Structure of the Earth Module 2 : Geological Structures Week 4: Module 1 : Introduction to Geological Hazards Module 2 : Environmental impacts of Geological hazards Week 5: Module 1 : Active faults and its related hazard in India Module 2 : Active faults Mapping and Applications

S.No.	Course ID	Course Name	Course syllabus
			Week 6: Module 1 : Tsunami and related hazard Module 2 : Landslide and Subsidence Week 7: Module 1 : Landslide and Subsidence Module 2 : Flood and related hazard Module 3 : Groundwater Week 8: Module 1 : Applications of Earth Sciences in Civil Engineering Module 2 : Civil Engineering applications – geological considerations in Rivers Module 3 : Civil Engineering applications – geological considerations in Dams Module 4 : Civil Engineering applications – geological considerations in Tunnels
2	noc23-ce107	Engineering Geology	Week 1: Advances in engineering geology, significance and kinds of geo-ground, geomorphology of river valley and mountainous regions and landforms. Week 2: Rock-water interaction, weathering, weathering indices, erosion, and deposition. Week 3: Engineering geological properties of rocks, concept of geological strata and geomechanical classification of rock strata. Week 4: Geological construction materials, deleterious rocks, and cement-aggregates reactions. Week 5: Engineering Geology of dams and forces acting on dams Week 6: Tunnels and methods of tunneling, treatment and anchoring of geological strata. Week 7: Effect of geological structures such as folds, faults, beddings, foliations and lineations on stability of dams foundation and tunnels Week 8: Rock-load/ground pressure, factors affecting ground pressure, method for determination of ground pressure, and support system. Week 9: Engineering geological investigations for roads and highways, bridges and buildings foundations Week 10: Engineering Geological Natural hazards and mitigations: landslide, earthquakes and induced seismicity

S.No.	Course ID	Course Name	Course syllabus
			Week 11: Geomorphology of sea and sea shore, shoreline engineering geology, hazards and mitigation Week 12: Engineering geological aspects of geothermal energy, Coal bed methane (CBM), Gas hydrate, shale gas, Carbon Capture, Usage and Storage (CCUS).
3	noc23-ce57	Mechanics of Materials	Week 1: Mathematical Preliminaries Week 2: Concept of Force, Displacement and stress Week 3: Transformation of stress and equilibrium equation Week 4: Concept of strain Week 5: Governing equations in mechanics Week 6: Displacement due to uniaxial loading, temperature and bending Week 7: Stresses and deflection in homogeneous beams loaded about one principal axis Week 8: Stresses and deflection in beams loaded about principal axis Week 9: Stresses and deflection in beams not loaded about principal axis Week 10: Stresses and displacement due to torsion Week 11: Pressure vessels and Failure criteria Week 12: Buckling
4	Noc23_ce63	Introductory Field Structural Geology	Week 1: Basics and Ethics of Field Geology ; Tools and Equipments ; Geological Maps and features ; Locating yourself in the field ; Defining structural elements in the field Week 2: Primary structures ; Secondary structures ; Measurement and record of structural data; Sample collection ; Geometrical parameters of folds definition and measurements ; Fold geometries in outcrop scales Week 3: Superposed deformation ; Sequence of deformation from superposed fold patterns ; Ductile shear zones ; Shear Sense indicators ; Strain analysis from deformed markers Week 4: Brittle Deformation ; Analysing brittle deformation ; Mapping structural data ; Interpreting large-scale structures ; Summary & Conclusion
5	Nc23_ce64	Remote Sensing and GIS	Week 1 : Remote Sensing Data and Corrections Week 2 : Satellite Image Corrections Week 3 : Digital Image Processing-I

S.No.	Course ID	Course Name	Course syllabus
			Week 4 : Digital Image Processing-II Week 5 : Thermal and Microwave Week 6 : Imaging Spectroscopy-I Week 7 : Imaging Spectroscopy-II & GIS-I Week 8 : GIS-II and Application
6	Noc23_ce67	Optimization Methods for Civil Engineering	Week-1: Introduction to optimization Week-2: Linear Programming Problem Week-3: Classical Optimization methods Week-4: Classical Optimization methods Week-5: Classical Optimization methods Week-6: Classical Optimization methods Week-7: Metaheuristic optimization methods Week-8:Metaheuristic optimization methods Week-9: Metaheuristic optimization methods Week-10:Engineering application using MATLAB and Excel solver Week-11:Engineering application using MATLAB and Excel solver Week-12: Civil Engineering Application
7	Noc23_ce69	Subsurface Exploration :Importance and Techniques Involved	Week 1: Importance of site investigation, Classification of investigations Week 2: Test Pits+ Borings, Ground water table and rock drilling, Standard Penetration Test Week 3: Cone Penetration test, Dilatometer Test, Pressuremeter Test Week 4: Seismic refraction survey, Seismic reflection survey, Electrical Resistivity Test, Magnetic anomaly test Week 5: Suspension logging test, Gravity test, Offshore and onshore investigations Week 6: Drill ships, barges, Jacket up platforms, positioning, Anchored structure, pipelines Week 7: Terminologies in Pile foundation Week 8: Pile drivability test, Pulse Echo Method (PEM)
8	Noc23_ce71	Environmental Geomechanics	Week 1 : Introduction, Nature of Soil Week 2 : Natural and Manmade Environments Week 3 : Physico-chemical Characterization of Soil

S.No.	Course ID	Course Name	Course syllabus
			Week 4 : Mineralogical Characterization of Soil Week 5 : Soil-water-air Interaction Week 6 : Shrinkage and Swelling Week 7 : Cracking Characteristics of Soil Week 8 : Hydraulic Conductivity Week 9 : Mass Transport Phenomena Week 10 : Thermal and Electrical Properties of Soils Week 11 : Thermal and Electrical Properties of Soils Week 12 : Applications
9	Noc23_ce75	Introduction to Multimodal Urban Transportation Systems (MUTS)	Week 1: Module 1: Overview of urban transportation Lec. 1: Urbanization and Transport (0.5 hr.) Lec. 2: Key issues in urban transportation (0.5 hr.) Lec. 3: Challenges in urban transportation (0.5 hr.) Lec. 4: Travel demand modelling overview (0.5 hr.) Lec. 5: Vehicular Level of Service (LOS) overview (0.5 hr.) Week 2: Module 2: Public Transportation Lec. 6: Introduction to public transportation (0.5 hr.) Lec. 7: Basic operating elements of public transportation (0.5 hr.) Lec. 8: Basic operating elements of public transportation (contd.) (0.5 hr.) Lec. 9: Bus Transportation (0.5 hr.) Lec. 10: Bus Transportation (contd.) (0.5 hr.) Week 3: Module 2: Public Transportation Lec. 11: Financing public transportation (0.5 hr.) Lec. 12: Transit marketing (0.5 hr.) Lec. 13: Rail transportation (0.5 hr.) Lec. 14: Intermediate Public Transportation (0.5 hr.) Lec. 15: Measuring performance of transit systems (0.5 hr.) Week 4:

S.No.	Course ID	Course Name	Course syllabus
			Module 2: Public Transportation Lec. 16: Advanced operation concepts of public transportation (0.5 hr.) Lec. 17: Bus & Rail Transit Capacity (0.5 hr.) Lec. 18: Bus & Rail Transit Capacity (contd.) (0.5 hr.) Lec. 19: Station Capacity (0.5 hr.) Lec. 20: Transit Stop Location (0.5 hr.) Week 5: Module 3: Non-Motorised Transportation (NMT) Planning Lec. 21: Introduction to NMT Systems (0.5 hr.) Lec. 22: Assessing existing NMT scenario (0.5 hr.) Lec. 23: Data collection and analysis in NMT Planning (0.5 hr.) Lec. 24: Complementarity and Selection of Interventions (0.5 hr.) Lec. 25: Alternative Selection through Economic & Financial Analysis (0.5 hr.) Week 6: Module 3: Non-Motorised Transportation (NMT) Planning Lec. 26: Introduction to NMT systems (0.5 hr.) Lec. 27: Basic NMT Characteristics (0.5 hr.) Lec. 28: Pedestrian Data Collection and Flow Characteristics (0.5 hr.) Lec. 29: PTS Case Studies Pedestrian flow characteristics on facilities (0.5hr.) Lec. 30: Pedestrian Level of Service (PLOS) based on Flow models (0.5hr.) Week 7: Module 3: Non-Motorised Transportation (NMT) Planning Lec. 31: Other types of Pedestrian Level of Service (PLOS) (0.5 hr.) Lec. 32: HCM 2010 Methodology for PLOS (0.5 hr.) Lec. 33: HCM 2010 Methodology for PLOS (contd.) (0.5 hr.) Lec. 34: Bicycle Facilities and Level of Service (BLOS) (0.5 hr.) Lec. 35: BLOS and Bicycle Compatibility Index (BCI) (0.5 hr.) Week 8: Module 3: Non-Motorised Transportation (NMT) Planning Lec. 36: NMT Design Principles (0.5 hr.) Lec. 37: Design of Pedestrian Infrastructure (0.5 hr.)

S.No.	Course ID	Course Name	Course syllabus
			Lec. 38: Design of Pedestrian Infrastructure (contd.) (0.5 hr.) Lec. 39: Design of Cycling Infrastructure (0.5 hr.) Lec. 40: Design of Cycling Infrastructure (contd.) (0.5 hr.) Week 9: Module 4: Urban Transport & Sustainability Lec. 41: Travel Demand Management (TDM) overview (0.5 hr.) Lec. 42: Push measures cases (0.5 hr.) Lec. 43: Pull measure cases (0.5 hr.) Lec. 44: Parking Studies (0.5 hr.) Lec. 45: Transit Oriented Development (TOD) (0.5 hr.) Week 10: Module 4: Urban Transport & Sustainability Lec. 46: Introduction to Intelligent Transportation Systems (ITS) (0.5 hr.) Lec 47: ITS components, applications and communication (0.5 hr.) Lec. 48: ITS Architecture (0.5 hr.) Lec. 49: Electronic Toll Collection (ETC) (0.5 hr.) Lec. 50: Public Bicycle Sharing (PBS) System with ITS (0.5 hr.) Week 11: Module 4: Urban Transport & Sustainability Lec. 51: Multimodal transportation (MMT) environment (0.5 hr.) Lec. 52: Multimodal Level of Service (MMLOS) (0.5 hr.) Lec. 53: Multimodal Level of Service (MMLOS) (contd.) (0.5 hr.) Lec. 54: Design of multimodal transfer facilities (0.5 hr.) Lec. 55: Park & Ride (P&R) Facility Planning (0.5 hr.) Week 12: Module 4: Urban Transport & Sustainability Lec. 56: An Introduction to Pedestrian Road Safety and associated Risk Factors (0.5 hr.) Lec. 57: Road crash estimation and elements of predictive methods (0.5 hr.) Lec. 58: Predicting Vehicle-Pedestrian and Vehicle-Bicycle conflicts (0.5 hr.) Lec. 59: Environmental Concerns of Urban Transport (0.5 hr.)

S.No.	Course ID	Course Name	Course syllabus
			Lec. 60: Sustainable strategies for Urban Transportation (0.5 hr.)
10	Noc23_ce78	Ground Improvement	Week-1: Introduction Week-2: Shallow Densification Week-3: Deep Dynamic Compaction Week-4: Rapid Impact Compaction Week-5: Vibrocompaction Week-6: Drainage and Dewatering Week-7: Excavation and Replacement Week-8: Preloading and Vertical Drain for Densification Week-9: Grouting Methods Week-10: Chemical Stabilisation Week-11: Soil Nailing and Ground Anchors Week-12: Use of Geosynthetics in Various Ground Improvement Problems
11	Noc23_ce82	Availability and Management of Groundwater Resources	Week 1: Introduction of hydrological cycle, need for conservation of groundwater resources Week 2: Geologic formations as aquifers Week 3: Vadose and saturated zones Week 4: Confined and unconfined aquifers and their parameters Week 5: Porosity, permeability, transmissivity and storage coefficient Week 6: Law of groundwater movement, Darcy's law and applications Week 7: Estimation of Subsurface runoff, Types of wells, Well Hydraulics Week 8: Measurement of rainfall, Index of wetness, Infiltration rate Week 9: Estimation of Total Annual Replenishable Natural Groundwater Recharge Week 10: Groundwater resources planning and management Week 11: Rainwater Harvesting and Artificial groundwater recharge Week 12: Impact of climate change on water resources
12	Noc23_ce89	Integrated Waste Management for A Smart City	Week 1: Introduction to Solid Waste Management Week 2: Municipal Solid Waste Characteristics and Quantities Week 3: MSW Rules 2016, Swachh Bharat Mission and Smart Cities Program Week 4: Municipal Solid Waste Collection, Transportation, Segregation and Processing

S.No.	Course ID	Course Name	Course syllabus
			Week 5: Disposal of Municipal Solid Waste: Landfill Week 6: Biochemical Processes and Composting Week 7: Energy Recovery from Municipal Solid Waste Week 8: Current Issues in Solid Waste Management and Review of MSW Management Status in First List of 20 Smart Cities in the Country Week 9: Construction and Demolition (C&D) Waste Management - Overview Week 10: C&D Waste – Regulation, Beneficial Reuse of C&D Waste Materials Week 11: Electronic Waste (E-Waste) Management – Issues and Status in India and Globally Week 12: E-Waste Management Rules 2016 and Management Challenges
13	Noc23_ce90	Sustainable Engineering Concepts and Life Cycle Analysis	Week 1: An Introduction to Sustainability Concepts and Life Cycle Analysis (Introduction, Material flow and waste management, What it all means for an engineer? Water energy and food nexus) Week 2: Risk and Life Cycle Framework for Sustainability (Introduction, Risk, Environmental Risk Assessment, Example Chemicals and Health Effects, Character of Environmental Problems) Week 3: Environmental Data Collection and LCA Methodology (Environmental Data Collection Issues, Statistical Analysis of Environmental Data, Common Analytical Instruments, Overview of LCA Methodology - Goal Definition, Life Cycle Inventory, Life Cycle Impact Assessment, Life Cycle Interpretation, LCA Software tools) Week 4: Life Cycle Assessment – Detailed Methodology and ISO Framework (Detailed Example on LCA Comparisons, LCA Benefits and Drawbacks, Historical Development and LCA Steps from ISO Framework) Week 5: Life Cycle Inventory and Impact Assessments (Unit Processes and System Boundary Data Quality, Procedure for Life Cycle Impact Assessment, LCIA in Practice with Examples, Interpretation of LCIA Results) Week 6: Factors for Good LCA Study (ISO Terminologies, LCA Steps Recap, Chemical Release and Fate and Transport, and Green Sustainable Materials) Week 7: Design for Sustainability (Environmental Design for Sustainability: Economic, Environmental Indicators, Social Performance Indicators, Sustainable Engineering Design Principles and Environmental Cost Analysis)

S.No.	Course ID	Course Name	Course syllabus
			Week 8: Case Studies (e.g., Odour Removal for Organics Treatment Plant, Comparison of Hand Drying Methods, Biofuels for Transportation, Kerosene Lamp vs. Solar Lamp, Bioplastic etc.).
13	Noc23_ce94	Global Navigation Satellite Systems and Applications	Week-1: Introduction to Global Navigation Satellite System (GNSS) How position is determined by the GNSS? (Part-I) How position is determined by the GNSS? (Part-II) How position is determined by the GNSS? (Part-III) NAVSTAR - Global Positioning System Week-2: Global Navigation Satellite System (GLONASS) BeiDou Navigation Satellite System (BDS) Indian Regional Navigation Satellite System (IRNSS) GALILEO Quasi-Zenith Satellite System (QZSS) Week-3: Differential Global Navigation Satellite System (DGNSS) REAL-TIME KINEMATIC (RTK) Satellite Based Augmentation System (SBAS) GNSS Errors GNSS Correction Methods Week-4: Why altitude estimated by GNSS receivers is not very accurate Global Navigation Satellite Systems (GNSS) Applications - I Global Navigation Satellite Systems (GNSS) Applications - II GNSS: Current Trends and Future GNSS: Opportunities in India

Head