JGI JAIN DEEMED-TO-BE UNIVERSITY | FACULTY OF ENGINEERING AND TECHNOLOGY

Department of Civil Engineering

Ph.D. Common Entrance Test Syllabus - 2022

1. **Structural Engineering**
   - **Engineering Mechanics**
     System of forces, free-body diagrams, equilibrium equations; Internal forces in structures; Frictions and its applications; Centre of mass; Free Vibrations of un damped SDOF system.
   - **Strength of Materials**
     Bending moment and shear force in statically determinate beams; Simple stress and strain relationships; simple bending theory, flexural and shear stresses, shear centre; Uniform torsion, Transformation of stress; buckling of column, combined and direct bending stresses.
   - **Design of Steel Structures**
     Principles of limit state method, Built-up sections and frames, Design of connections, Design of Industrial roofs, Design of simple members and frames. Concept of plastic analysis - beams and frames.
   - **Design of Concrete Structure**
     Design principle using Limit state method, Design of beams, slabs, columns, Limit state and ultimate load design concepts, Analysis of beam sections, Bond and development length. Prestressed concrete beams.
   - **Structural Analysis**
     Statically determinate and indeterminate structures, Displacement methods, Analysis of trusses, arches, beams, cables, and frames, Stiffness and flexibility methods, Influence lines. Analysis of trusses, arches, beams, cables and frames; Displacement methods: Slope deflection and moment distribution methods.

2. **Construction Materials and management**
   - **Construction Planning and Management**
     Construction activity, Use of Basic principles of network - analysis in form of CPM and PERT, Quality assurance principles, Basic principles of Economic analysis and methods, Cost optimization and resource allocation, Project profitability
   - **Construction Materials**
     Construction Materials: Structural Steel – Composition, material properties and behavior; Concrete - Constituents, mix design, short term and long-term properties. Portland cement – its manufacture, physical and chemical properties; Standard test methods; Different types of Portland and other cements – a brief introduction; Properties of fine and coarse aggregates; Properties and standard test method concrete in fresh and hardened state

3. **Transportation Engineering**
   - **Surveying**
     Various types of surveying (based on methods and instruments), classifications, principles of surveying, instruments required for linear measurement, minor instruments for setting out right angle.
   - **Highway Engineering**
     Geometric design of highways - cross-sectional elements, sight distances, horizontal and vertical alignments. Geometric design of railway Track – Speed and Cant. Concept of airport runway length, calculations and corrections; taxiway and exit taxiway design.

4. **Geo technical engineering**

Three-phase system and phase relationships, index properties; Unified and Indian standard soil classification system; Permeability - one dimensional flow, Seepage through soils – two - dimensional flow, flow nets, uplift pressure, piping, capillarity, seepage force.

5. **Hydraulics and Hydrology**
   - **Fluid Mechanics**
     Basic Concepts and Definitions – Distinction between a fluid and a solid, Fluid as a continuum, Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity, , vapour pressure, boiling point, surface tension, capillarity, Bulk modulus of elasticity, compressibility.
   - **Hydrology**
     Scope of Hydrology, Hydrological Cycle, Water-Budget Equation, Forms of precipitation, Measurement of Precipitation, Rain gauge Network, Preparation and Presentation of Rainfall Data, Mean Precipitation over an area, Depth-Area-Duration Relationship, Intensity

6. **Environmental Engineering**

Need for protected water supply. Demand of Water: Types of water demands -domestic demand, industrial, institutional and commercial, public use, fire demand, Factors affecting per capita demand, Variations in demand of water, Peak factor, Design period and factors governing design period.

7. **Remote sensing and GIS**

Remote Sensing: Basic concept of Remote sensing, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. **Geographic Information System:** Introduction to GIS; components of a GIS; Geographically Referenced Data, Spatial Data- Attribute data-Joining Spatial and attribute data, GIS Operations.

Reference Text Books

1. Design of Steel Structures by N. Subramanian, Oxford University Press
2. Limit state design of steel structures, McGraw Hill Education (India)publisher
3. Reinforced concrete structures (Limit state design), ASIN: B079ZYBGDX · Publisher: STANDARD BOOK HOUSE SINCE 1960; 3rd edition (22 February 2018).
4. Construction Planning and Management by P S Gahlot, B M Dhir, New Age International (P) Ltd., Publishers
5. Engineering Mechanics by S. S Bhavikatti, New Age Engineering Mechanics, (English, Papaerback, S S Bhavikatti)
6. Transportation Infrastructure Engineering, Lester Hoel, By (author) Nicholas Garber, By (author) Sadek, A Multimodal Integration, SI Version, Publication City/Country Florence, KY, United States
7. Textbook of Soil Mechanics and Foundation Engineering Geotechnical Engineering Series (PB 2018) Paperback – 1 January 2018. by Murthy V. N. S. (Author), C B S publishers
8. Construction Materials, Methods and Techniques 3Rd Edition by Spence, Thomson India
9. Fundamentals of Solid Mechanics, A Treatise on Strength of Materials by M L Gambhir, Publisher: Phi Learning Pvt. Ltd-New Delhi
10. Engineering Hydrology – Subramanya.K; Tata Mcgraw Hill NewDelhi-2008 (Ed)
11. Dr. P N Modi and Seth, Hydraulics and Fluid Mechanics Including Hydraulic Machines, Standard Book House, Delhi, 2015
12. Garg, S.K. Environmental Engineering, Vol. I Khanna Publishers, New Delhi, 2010
13. SURVEYING – VOL – I, B.C. PUNMIA, Ashok Kumar Jain, Lakshmi Publication, 2016
14. Anji Reddy, “Remote Sensing and Geographical Information Systems”, BS Publications 2001