

## Syllabus for the post of Assistant Professor

### in the discipline of Infrastructure and Engineering

#### 1. Infrastructure Development and Management

Introduction to Indian Infrastructure. Govt. initiatives through various five year plans. Overview of various sectors of infrastructure and SEZ. Infrastructure procurement through Public-Private-Partnership. Sector-wise differences in policies, Concession agreement, Selection procedure of concessionaires, Issues in financial closure, Stakeholder management. Financial Models, Risk management, Environmental Impact Assessment

#### 2. Infrastructure Scheduling and Monitoring

Infrastructure planning, Work break down structure, PERT, CPM, Precedence Network, Time constrained Resource allocation and resource constrained problems, Time Cost trade off, project updating and control using EVM, Construction contracts and its types, tendering procedure, estimation and fixing of markup, bidding models, claims compensation and disputes, dispute resolution models, FIDIC contracts,

#### 3. Optimization

Linear programming, Problems in infrastructure, Formulation, Graphical solution, Simplex method, Dual problem, sensitivity analysis and their application to Infrastructure engineering, Transportation Assignment problems and their applications

#### 4. Infrastructure Planning and Management Engineering

Urban and rural infrastructure planning; risks associated; project governance; infrastructure maintenance; innovative infrastructure financing; polycentric governance

#### 5. Environmental Engineering

Sources of wastewater; primary and secondary treatment methods; sludge characteristics; Air pollutants; Effect of air pollution of human health, vegetation, and materials; Pollution monitoring; Control equipment; Indoor air pollutions; Management of solid waste; Environmental Risk Assessment; Treatment of hazardous waste.

#### 6. Urban Transportation Planning (PE)

Urban transportation planning process and concepts, Travel demand estimation, Mode split and route split analysis, Land use-Transportation models

**7. Smart Infrastructure Engineering**

Various infrastructure systems; need of smart infrastructure; data acquisition and applications; data analysis using AI and ML techniques and their applications in infrastructure systems; control systems applications in infrastructure; design of smart infrastructure with adaptive capabilities

**8. Cyber-Physical Systems for Infrastructure**

Cyber-physical systems applications in infrastructure engineering; instrumentation; wireless communications and networks; energy and power sources

**9. Green Building and Sustainable Materials**

Design; Assessment; sustainable site and landscape; energy and carbon footprint; Built environment hydrological cycle; Green materials; Indoor environmental quality; Green building economics

**10. Infrastructure economics and finance**

Time value of money, discounted cash flow, NPV, ROR. Basis of comparison, Incremental rate of return, Benefit cost analysis, Replacement analysis, Break even analysis. Depreciation and amortization. Working capital management, financial plan and multiple source of finance.