

SEMESTER – III

21CN71 PROJECT WORK – I
vide Automotive Engineering 21AE71

SEMESTER – IV

21CN81 PROJECT WORK – II
Vide Automotive Engineering 21AE81

PROFESSIONAL ELECTIVE THEORY COURSES (Four to be opted)

21CN21 ADVANCED REINFORCED CONCRETE DESIGN
vide Structural Engineering 21CS04

21CN22 ADVANCED STRUCTURAL STEEL DESIGN
vide Structural Engineering 21CS05

21CN23 PRESTRESSED CONCRETE STRUCTURES
vide Structural Engineering 21CS22

21CN24 BRIDGE ENGINEERING
vide Structural Engineering 21CS23

21CN25 ADVANCED CONCRETE TECHNOLOGY
vide Structural Engineering 21CS26

21CN26 MAINTENANCE AND REHABILITATION OF STRUCTURES
vide Structural Engineering 21CS36

21CN27 CORROSION IN REINFORCED CONCRETE

3 0 0 3

BASICS OF CORROSION: Theoretical Concepts of Corrosion of Steel in Concrete Structures. Mechanism of Chloride induced and carbonation induced Corrosion - parameters influencing rebar corrosion (11)

FORMS OF CORROSION & CORROSIVE ENVIROMENTS: Galvanic Corrosion, Crevice Corrosion, Pitting Corrosion, Integranular corrosion, Erosion and hydrogen embrittlement. Mineral Acids, Organic Acids, Atmosphere Corrosion, sewage water treatment plants. (11)

CORROSION MEASUREMENT & EVALUATION: Weight Loss method, Half cell potential Technique – Linear Polarization Resistance, Galvanostatic Pulse Technique – Electrochemical Impedance Spectroscopy, Cyclic Polarisation and Voltammetry and Corrosion Sensors for field monitoring. (11)

CORROSION PREVENTION: Materials Selection: Metals & Alloys - Metal purification, Alteration of Environment changing mediums - Electrochemical techniques - Cathodic & Anodic protection, Sacrificial Anode. Coatings: metallic & other Inorganic coatings - Organic coatings - Corrosion inhibitors. (12)

Total L: 45

REFERENCES:

1. Amir Poursaee, "Corrosion of Steel in Concrete Structures", First Edition, Elseiver, Wood Head Publishing, 2016.
2. Luca Bertolini et al, "Corrosion of Steel in Concrete, Prevention, Diagonisis, Repair", Second Edition, Wiley Publishing, 2014.
3. Mars G. Fontana, "Corrosion Engineering", Third Edition, McGraw Hill Book Company, New York 1988.
4. Hans Bohni, "Corrosion in Reinforced Concrete Structures", Woodhead Publishing Limited, Cambridge England, 2005.

21CN28 PREFABRICATED STRUCTURES
vide Structural Engineering 21CS35

21CN29 OPTIMIZATION TECHNIQUES
vide Structural Engineering 21CS27

21CS30 EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION
vide Structural Engineering 21CS29

21CN31 ENVIRONMENTAL IMPACT ASSESSMENT

3 0 0 3

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OBJECTIVES AND NEED: Impact of Civil Engineering development projects on environment – International scenario of environment protection – Environmental protection methods – Environmental Impact Assessment (EIA) – Objectives and need - Environmental Impact statement (EIS) – EIA capability and limitations – Legal provisions on EIA – Indian legislation to protect environment - environmental clearance procedure - Guidance for Industrial licensing. (11)

EIA METHODOLOGIES - PREDICTION AND ASSESSMENT: Methods of EIA – Checklists – Matrices – Networks – Cost-benefit analysis – environmental pricing – analysis of alternatives - case studies. Assessment of Impact on land, water and air, noise, social, cultural flora and fauna - Mathematical models - public participation. (12)

ENVIRONMENTAL MANAGEMENT PLAN: Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, flora and fauna; Addressing the issues related to the project affected people - Rapid EIA - ISO 14000 - EIA in India – Environmental guidance for infrastructure projects and river valley projects – Legislations and Institutional support – International cooperation. (11)

EIA FOR INFRASTRUCTURE PROJECTS: Case studies on bridges – power plants – highways – dams – urban development – water supply and drainage projects. (11)

Total L: 45

REFERENCES:

1. Anji Reddy M, "Environmental Impact Assessment: Theory and Practice", BS Publications, Hyderabad, 2017.
2. Barthwal RR, "Environmental Impact Assessment", New Age International P Ltd, New Delhi, 2014.
3. Charles H Eccleston, "Environmental Impact Assessment: A Guide to Best Professional Practices", CRC Press, 2011.
4. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Scientific Publications, London 2005.
5. Peter Morris and Rikki Therivel, "Methods of Environmental Impact Assessment", SPON Press, London, 2003.

21CN32 MODERN MATERIALS FOR CONSTRUCTION

3 0 0 3

MICROSTRUCTURE AND MATERIAL BEHAVIOUR: Introduction to the physics and chemistry of materials, focusing on chemical bonding, crystal structure, mechanical properties, phase transformation, Energy in building materials and buildings, Green and climate responsive buildings . (11)

STRUCTURAL MATERIALS: Criteria and application of structural materials: Ceramics and Glass, Metals, Polymers, Fire proofing materials. Different types of cladding Materials-Cladding systems for interior and exterior sides for different types of buildings. Different types of wall paneling materials-types of wall paneling system-gypsum based boards-GFRG, light weight pillar blocks, foam concrete blocks etc., Typical industrial by products, agro waste and other biomass resources. Materials used in Pavement Construction-Sub grade materials, Rigid and Bituminous paving materials. Application of Geo textiles in roads and infrastructure projects. (11)

NON-STRUCTURAL MATERIALS: Criteria for selection of non-construction materials: PVC, EPOXY, Thermocole, Geotextile, Acoustics, Thermal and sound insulation materials, Green building materials, special paints for Road marking. Construction chemicals – sealants, engineering grouts, mortars, admixtures and adhesives. Scope and application of different types of Smart and Intelligent materials. (11)

SPECIAL CONCRETE: Special concrete for Bridges, Pavement and Off shore structures- High strength and high-performance concrete - FRP - FRC- Lightweight concrete - vacuum concrete - silica fume concrete – Ferro cement concrete – Bacterial concrete, self-curing and self-healing concrete, Polymer concrete composites, roller compacted concrete. (12)

Total L: 45

REFERENCES:

1. Shan Somayaji, "Civil Engineering Materials", Second Edition, Prentice Hall Inc., 2001.
2. Mamlouk M.S, Zaniewski J.P., "Materials for Civil and Construction Engineers", Prentice Hall Inc., 4th edition 2016.
3. Neveille A.M and Brooks J J., "Concrete Technology", Longman, 2010.
4. EdwarNavy E G., "Concrete Construction Engineering Handbook", CRC press, New York, 2008.
5. Sherwood, P.T. Alternative materials in road construction, Thomas Telford, New York, USA, 2nd edition 2001.

21CN33 SMART MATERIALS AND SMART STRUCTRES

vide Structural Engineering 21CS37

21CN34 CITY PLANNING AND URBAN DESIGN

3 0 0 3

CITY AND METROPOLITAN PLANNING: Evolution of cities; principle of city planning; type of cities & new towns; Indian cities and metropolises constraints and prospects, Polarization of economic socio cultural and administrative activities: Distribution of urbanization process; National settlement policies; eco city concept; sustainable development. Metropolitan plan making processes, metropolitan plans in India, Metropolitan planning strategies. (11)

TECHNIQUES OF PLANNING: Planning survey techniques; Conducting survey; statistical methods of data analysis; report presentation; application of GIS and remote sensing techniques in urban and regional planning; decision making models. (11)

DEVELOPMENT ADMINISTRATION AND MANAGEMENT: Scope and content of master plan and structure plan, integrated urban development plans and IDSMT and urban development projects; Planning laws; development control and zoning regulations; law relating to land acquisition; development enforcements, urban land ceiling, scope and content of zonal development plans, detailed town planning schemes, area development plans, action plans and subject plans. Land management techniques; planning and municipal administration; disaster mitigation management; 73rd and 74th constitutional amendments; public participation and role of NGO & (12)

URBAN DESIGN: Definition of urban design, scope of urban design under Indian context and its integration with urban planning; Historical development and approach to urban design; urban form; Urban structure and design rational inter-relationship between economic activities, public organization, communication system, urban conservation and land-use structure. Organization of space. Review and designing of urban renewal and redevelopment projects for old and new town. (11)

Total L: 45

REFERENCES:

1. Pratap Raw M, "Urban Planning Theory and Practice", CBS Publisher, 2005.
2. Simon Eisner, Arthur B Gallion, "Urban Pattern City Planning and Design, CBS Publisher, 2004.
3. Peter Hall, "Urban and Regional Planning", Taylor and Francis, 2003.
4. Sundaram K.V, "Urban and Regional Planning in India", Vikas Publishing House Pvt. Ltd., New Delhi, 2000.
5. Malcolm Moor, Jon Rowland "Urban Design Futures" Taylor & Francis, 2006.

21CN35 INFRASTRUCTURE PLANNING AND MANAGEMENT

3 0 0 3

OVERVIEW OF INDIAN INFRASTRUCTURE ASSETS: Infrastructure – Definition – Infrastructure management – Importance of infrastructure management; Types of infrastructure – Physical Infrastructure – Current scenario and government policies related to different sectors – Roads, Railways, Ports, Airports, Energy, Power, Telecommunication, MRTS – Key issues in different sectors – Phases in infrastructure project – Stakeholders and key players. (11)

PROJECT ECONOMICS AND FINANCE: Cash flow diagram – Time value of money – Single payment, uniform series of payment – Arithmetic gradient, geometric gradient; Financial returns analysis – Present worth analysis, annual worth analysis, future worth analysis – Rate of return, Incremental rate of return, benefit-cost analysis. (10)

PROJECT IMPLEMENTATION: Traditional approach; Private sector participation – BOO, BOT, DBOT, DBOOT, BOOT, EPC & Turnkey – Case studies; Execution of PPP Projects : Need analysis – Evaluation of technical, economic and financial feasibility – Value proposition of projects – Risk analysis – Project structuring. (11)

EVALUATION OF EXISTING ASSETS: Infrastructure asset management framework – Planning, needs assessment – Performance Indicators; Data requirement and database management – Inventory, historical and environmental data – In-service monitoring and Evaluation data; Illustration of asset management for road sector – Pavement evaluation – Pavement condition indices – Pavement deterioration modeling – Prioritization and optimization based on cost and agency criteria – Introduction to HDM-4 software (13)

Total L: 45

REFERENCES:

1. Uddin, W., Hudson, W. R and Haas, R. Public Infrastructure Asset Management, McGraw Hill Publication, USA, Second edition, 2013.
2. Yescombe, E. R. & Edward, F. Public-Private Partnerships for Infrastructure: Principles of Policy and Finance, Elsevier Science & Technology, Second edition, 2018.
3. Khan, Z. A., Siddiquee, A. N., Kumar, B. and Abidi, M. H. Principles of Engineering Economics with Applications, Cambridge University Press, United Kingdom, Second Edition, 2018.

21CN36 FINANCIAL MANAGEMENT AND ACCOUNTING

3 0 0 3

BASIC ACCOUNTING, BALANCE SHEET & MANAGEMENT ACCOUNTING: Meaning of Accounting - Definition and objectives. Need for accounting- Internal and external users of accounting information-Branches of Accounting - Accounting

Information system - Accounting Cycle – Accounting Concepts, Conventions and Principles - The Corporate Balance Sheet – Format of Balance sheet – Balance Sheet as per company law and annexure to it– Generally Accepted Accounting Principles - Financial Accounting vs. Management Accounting. (11)

FINANCIAL STATEMENTS ANALYSIS & MARGINAL COSTING: Characteristics – limitations - Ratio Analysis (Including Dupont Model): Interpretation - Difference between Cash flow and Fund flow - Meaning of a cash flow statement – classification of cash flows – Preparation and Interpretation of Cash Flow Statement - Direct Cost - Overheads – Cost Sheet – Cost - volume profit analysis – Break Even Point - Application of marginal costing techniques to Managerial Decision making. (11)

FINANCIAL MANAGEMENT & TIME VALUE OF MONEY: An overview – Nature & scope - Finance functions - goals of financial management - Financial manager's role - agency problems, agency cost - Long term finance - ordinary shares, right issue of equity shares, preference shares, debentures, term loan, asset-based financing-hire purchase, leasing, venture capital financing. Short term finance - trade credit, bank credit, bill discounting, commercial paper - Time value of money - Concept - future value - present value – single cash flows, annuity, uneven cash flows, multi period and continuous - yield calculation, applications: bond's valuation and yield - valuation of preference shares - valuation of ordinary shares. (11)

COST OF CAPITAL & RECEIVABLES MANAGEMENT: Concept - determining component cost of capital - weighted average cost of capital - weighted marginal cost of capital - Capital budgeting decisions - Evaluation of capital budgeting - discounted & non discounted cash flows methods – simple problems - Principles and concepts of working capital – operating cycle - determinants of working capital - policies for financing current assets - Inventory management and cash management – basic concepts only. (12)

Total L: 45

REFERENCES:

1. Sudarsana Reddy, "Financial Management", 2nd Revised Ed., Himalaya PH, 2010
2. Pandey, I M., "Financial Management", Vikas Publishing House, New Delhi, 10th Ed, 2010.
3. Chandra Prasanna, "Financial Management: Theory and Practice", Tata McGraw, New Delhi, 2010.
4. Jonathan Berk, "Financial Management", Pearson Education, 2010.
5. Ehrhardt, Michael and Brigham, Engene F, "Corporate Finance: A Focused Approach", Cenage Learning, Australia, 2009.
6. Bhat and Sudhindra, "Financial Management: Principles and Practice", Excel books, ND, 2007.

21CN37 ORGANISATIONAL BEHAVIOUR

3 0 0 3

IMPORTANCE OF OB & PERSONALITY: Definition, Meaning and Importance of OB, Historic developments of OB, Hawthorne experiment, Basic OB Model, Different approaches to OB, Contributing disciplines to OB, Scope of OB, Significance of OB - Origin of the word Personality, Determinants of Personality, Theories of Personality (Psychoanalytic theory, Self theory, Holland's personality theory, Myers Briggs Type Indicators and Big 5 personality theory), Attributes of personality. (11)

EMOTIONAL INTELLIGENCE & MOTIVATION: Definition and Meaning, Categories of intelligence, EI Dimensions, Physiology of EI, OB applications of emotions – Characteristics of Motivation, Process of Motivation, Theories of Motivation (Maslow's need theory, ERG theory, Hertzberg theory, Expectancy theory, Theory X & Y, McClelland's theory of needs, Goal setting theory, Equity theory), Incentives for Motivation. (12)

LEADERSHIP & GROUP DYNAMICS: Definition and Meaning, Styles of leadership, Theories of leadership (Trait theory, Ohio state theory, Managerial grid, Contingency theory, Path goal theory, Leader Member Exchange (LMX), Transactional & transformational leadership theory, Charismatic and Visionary leadership theory) - Difference between Group and Team, Groups in Organisation, Team Effectiveness model, Troubles with team, Social loafing. (11)

ORGANISATIONAL CULTURE & ORGANISATIONAL CHANGE: Meaning and Definition, Characteristics of Organisational culture, Elements of Organisational culture, Organisational sub culture, Artifacts for Organisational culture, Bicultural audit, Strategies to merge different organisational culture. - Factors of Organisational change, Lewin's forced field model, Human reactions to change, Resistance to change, Strategies for reducing change, Ethical issues in Organisational change. (11)

Total L: 45

REFERENCES:

1. Fred Luthans, "Organisational Behaviour", New York, McGraw Hill, 2011.
2. Stephen P. Robins, "Organisational Behaviour", Pearson Education, 2011.
3. Edwin Gerlof, "Organisation Theory and Design", McGraw Hills, 2011.
4. Danial C. Fieldman and Hugh Arnold, "Managing Individual and Group Behaviour in Organization", McGraw Hills, 2010.
5. Robrt Kreitener and Angelo Kinieki, "Organisational Behavior", Tata McGraw Hill, New Delhi, 2008.

21CN38 REMOTE SENSING

3 0 0 3

REMOTE SENSING SYSTEM: Elements of EMR - wavelength regions – energy interaction in atmosphere – scattering - atmospheric windows – terrestrial interaction – spectral reflectance curves – Planck's blackbody law – displacement law and emissivity effects - heat capacity, thermal property of objects – Radar interaction with Earth surface and vegetation, Surface scattering theory - active and passive remote sensing - platforms. Sensors used in remote sensing - types of resolutions. (11)

SATELLITE DATA PRODUCT AND INTERPRETATION OF SATELLITE IMAGERIES: Thermal sensors - thermal image interpretation, Radar principles and applications – SRTM and its application -Types of data product - software and hardware requirement for data processing - Elements of visual image interpretation - Digital Image processing techniques, Landuse / landcover classification. (11)

CHARACTERISTICS OF SATELLITES AND THEIR APPLICATIONS: GOES, NOAA, METEOSAT, INSAT - Land observation satellites: LANDSAT, SPOT, IRS, IKONOS, GEOEYE, QUICKBIRD, WORLDVIEW – SEASAT, SIR “A”, SIR “B”, SIR “C”, ERS, JERS, RADARSAT and other currently available satellites. (12)

REMOTE SENSING APPLICATIONS: Urban land use planning – urban sprawl - cadastral mapping - site selection for various infrastructure projects - resource management - mapping of infrastructure facilities and planning - integration of satellite imageries in GIS. (11)

Total L: 45

REFERENCES:

1. Lillesand T, Kiefer R. W and Chipman J., “Remote Sensing and Image Interpretation”, John Wiley & Sons, New York, 2015.
2. Jensen, John R., “Remote Sensing of the Environment: An Earth Resource Perspective”, 2nd Ed., Pearson India, 2013.
3. Sabins F F and Ellis J M, "Remote Sensing - Principles and Interpretation", 4th Edition, Waveland Press Inc., 2020.
4. Campbell J B and Wynne R H, "Introduction to Remote Sensing", Guilford Press, 2011.
5. George Joseph, Fundamentals of Remote Sensing, 2nd Edition, Universities Press, 2005

21CN39 FOUNDATION STRUCTURES
vide Structural Engineering 21CS39

21CN40 GEOSYNTHETICS IN INFRASTRUCTURE PROJECTS

3 0 0 3

GEOSYNTHETIC MATERIALS AND THEIR PROPERTIES: Basic descriptions of geosynthetics, types, functions, materials, manufacturing processes, properties and testing, Concepts and mechanism of reinforced soil, Factors influencing behaviour and performance. (12)

REINFORCED SOIL RETAINING WALLS AND SLOPE STABILITY: Components of reinforced soil walls, Principles of design – Internal and external stability – Design – Slope stabilization. (11)

ENVIRONMENTAL CONTROL, FILTRATION AND DRAINAGE: Liners for ponds and canals, covers and liners for landfills, material aspects and stability considerations; Applications, Geotextile filter requirements, boundary conditions, drain and filter properties, design criteria. (11)

EMBANKMENTS IN SOFT SOILS AND PAVEMENT: Embankment in soft soils - Analysis, Influence of reinforcement extensibility, deformation in foundation, Overall stability with respect to bearing. Pavement applications, Role of subgrade conditions, Design – The Giroud and Noiray approach, Geotextile serviceability, Application in pavement overlays. (11)

Total L: 45

REFERENCES:

1. Sivakumar Babu G L, “Introduction to Soil Reinforcement and Geosynthetics”, Universities Press, Hyderabad, 2009.
2. Mandal J N, “Geosynthetics Engineering: In Theory and Practice”, Research Publishing, Singapore, 2018.
3. Robert M Koerner, “Designing with Geosynthetics”, Pearson Education Inc., 2012.
4. Sanjay Kumar Shukla, “An Introduction to Geosynthetic Engineering”, CRC Press, 2017.

21CN41 GROUND IMPROVEMENT TECHNIQUES
vide Structural Engineering 21CS40

21CN42 CHARACTERISATION OF BITUMINOUS MATERIALS

3 0 0 3

BITUMEN: Refinery processing – Post-processing methods and their influence – Chemical composition – Characterisation – Fractionation procedures – Changes in chemical composition – Reversible and irreversible aging – Grading of bitumen. (11)

VISCOELASTICITY: Definition of viscoelastic material - Linear viscoelasticity – Scaling and superposition – Material functions for viscoelastic materials – Time domain: creep compliance, stress relaxation function – Frequency domain: complex modulus and phase angle – Time-temperature superposition principle – Construction of master curve (12)

BITUMINOUS MIXES: Design of mixes – Volumetrics of mix – Mixing and compaction procedures – Dynamic modulus and resilient modulus of mixtures – Simulation of rutting and fatigue of bituminous mixtures in laboratory: flow time, flow number, rut wheel and beam bending. (11)

ADDITIVES IN BITUMEN: Modifiers, Warm mix additives, Rejuvenators – Interaction with bitumen -Changes in microstructure – Influence on rheological properties – Current design procedures for bitumen modification, warm mixes, and recycling bitumen. (11)

Total L: 45

REFERENCES:

1. Huang, Y. Pavement Analysis and Design, Prentice hall, New Jersey Second edition, 2004.
2. Alan S. Wineman and Rajagopal, K. R. Mechanical Response of Polymers, Cambridge University Press, New York, 2000.
3. MS-2: Asphalt Mix Design Methods, Asphalt Institute, Seventh Edition, 2015.
4. Relevant ASTM and IS Standards as well as downloadable public documents will be provided for relevant topics.

OPEN ELECTIVE THEORY COURSES (One to be opted)

21CN91 WASTE TO ENERGY
vide Structural Engineering 21CS91

21CS92 SUSTAINABLE SOLID WASTE MANAGEMENT TECHNOLOGIES
vide Structural Engineering 21CS92