INSTITUTE OF ENGINEERING AND TECHNOLOGY
Dr. R.M.L. AVADH UNIVERSITY
AYODHYA

EVALUATION SCHEME & SYLLABUS

FOR

B.TECH. (CIVIL ENGINEERING)

THIRD YEAR

ON

CHOICE BASED CREDIT SYSTEM
(CBCS)

[Effective from the Session: 2025-2026]

B Tech. (Civil Engineering)-III Year

Semester V

S.No	Course Code	Course Title	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
1	HSMC501	Engineering Managerial Economics	3	0	0	30	20	50	100	150	3
2	CEC 501	Geotechnical Engineering	3	1	0	30	20	50	100	150	4
3	CEC 502	Design of Concrete Structures-I	3	1	0	30	20	50	100	150	4
4	CEC 503	Structural Analysis-II	3	1	0	30	20	50	100	150	4
5	CEC 504	Waste Water Engineering	3	1	0	30	20	50	100	150	4
Practical / Design / Drawing											
7	CEC 5L1	Geotechnical Engineering Lab	0	0	2			25	25	50	1
8	CEC 5L2	Environmental Engineering Lab	0	0	2			25	25	50	1
9	CEC 5L3	Computer Aided Design Lab	0	0	2			25	25	50	1
10	CEC 5L4	Certificate Course	0	0	2			25	25	50	1
		Total								**950**	**23**

B Tech. (Civil Engineering)-III Year

Semester VI

S No	Course Code	Course Title	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
1	CEC 601	Design of Steel Structures	3	1	0	20	30	50	100	150	4
3	CEC 602	Design of Concrete Structures-II	3	1	0	20	30	50	100	150	4
4	CEC-603	Transportation Engineering	3	1	0	20	30	50	100	150	4
6	CEC -604	Integrated Solid Waste Management	3	1	0	20	30	50	100	150	4
7		Departmental Elective-III	3	1	0	20	30	50	100	150	4
Practical / Design / Drawing											
9	CEC 6L1	Transportation Engineering Lab	0	0	2			25	25	50	1
10	CEC 6L2	STAAD Lab	0	0	2			25	25	50	1
11	CEC 6L3	Seminar	0	0	2			50		50	1
		Total								**900**	**23**

GEOTECHNICAL ENGINEERING

Course Objectives:

The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Analyze the soil for engineering parameters.
2. Calculate and analyze the stress on soil and be able to draw the stress path.
3. Analyze the effect of flow of fluids through soil.
4. Understand various bearing capacity determination techniques.

Course Outcomes:

1. To learn the basic engineering properties of soil.
2. To know the application of soil hydraulics.
3. To understand the stresses induced in soil.
4. To learn the effect of long term loading in soil.
5. Design the footing rest on soil medium.

Module	Topics	No. of Lectures
I	Origin and classification: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, sensitivity and thixotropy, Particle size analysis, Unified and Indian standard soil classification system.	[8]
II	Soil Hydraulics: Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Darcy's Law, hydraulic conductivity, equivalent hydraulic conductivity in stratified soil. Seepage, flow nets, seepage calculation from a flow net, flow nets in anisotropicsoils, seepage through earth dam, capillarity, critical hydraulic gradient and quick sand condition, uplift pressure, piping;	[6]
III	Soil compaction, water content-dry unit weight relationships. Factors controlling compaction. Field compaction equipment; field compaction control; Proctor needle method. Consolidation: Primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Consolidation test, Normal and Over Consolidated soils, determination of coefficient of consolidation	[8]
IV	Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination; direct and tri-axial shear test; unconfined compression test; pore pressure, Skempton's pore pressure coefficients. Earth pressure: Classical theories, Coulomb and Rankine's approaches for frictional and c-φ soils, inclined backfill, Graphical methods of earth pressure determination, Stability of slopes, Culman method & Method of slices, Stability number & chart.	[6]
V	Sub surface structure: Bearing capacity of shallow foundations, SPT, Plate load test; Effect of water table. Deep foundations: Types of piles, Static and dynamic formulae, Negative skin friction.	[5]

Suggested Readings:

Text & Reference Books:

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering
3. Narasinga Rao, B.N.D, "Soil Mechanics & Foundation Engineering", John Wiley & Sons.
4. Alam Singh – Modern Geotechnical Engineering
5. B.C. Punmia –Soil Mechanics and Foundation ,Laxmi Publication

E Learning links :

1. E-Learning Link https://nptel.ac.in/courses/105/105/105105168/

DESIGN OF CONCRETE STRUCTURES –I

Course Objectives:

The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Understand the stress Strain behaviour of concrete and reinforced concrete.
2. Design various structural members as per LSM theory.
3. To understand flexural /shear behaviour of beam, column and slab
4. To analyze the behaviour of axial loaded structure.
5. To analyze the members for serviceability.

Course Outcomes:

1. To calculate the basic material properties.
2. To learn the theories of design philosophies
3. To know the beam and slab design.
4. To design the axially loaded members.
5. To apply the serviceability check in various structure.

Module	Topics	No. of Lectures
I	Introduction to various Design Philosophies and assumptions in Limit State Design, Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section. Method of Rectangular Singly and Doubly Reinforced Sections. Design of Rectangular Singly and Doubly Reinforced beams, T-beams, Lbeams by Limit State Design Method.	[8]
II	Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, minimum and maximum shear reinforcement, design of beam in shear. Introduction to development length Anchorage bond, flexural bond. Failure of beam under shear, Concept of Equivalent Shear and Moments.	[8]
III	Design of one way, One way continuous and cantilever solid slabs by Limit State Design Method, Design of RCC staircases. Design of two way slabs by limit state method, Serviceability Limit States, Control of deflection, cracking and vibrations.	[10]
IV	Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts.	[8]
V	Structural behaviour of footings, Design of isolated footings, combined rectangular and trapezoidal footings by Limit State Method, Design of strap footings.	[8]

Suggested Readings:

Text & Reference Books:

1. Reinforced Concrete Design by S. U. Pillai & D. Menon, T.M.H., Publication
2. Reinforced Concrete -Limit State Design by A. K. Jain, Nem Chand & Bros., Roorkee.
3. Reinforced Concrete Vol. - II by H.J. Shah, Charotar Publisher, Gujarat.
4. RCC Designs (Reinforced Concrete Structures) by B.C. Punmia, Ashoka Kumar Jain and Arun Kumar Jain, Laxmi Publishers, New Delhi.
5. Reinforced Concrete Structures by R. Park and Pauley.
6. Bureau of Indian Standard IS 456-2000

E Learning links :

1. https://nptel.ac.in/courses/105/105/105105105/

STRUCTURAL ANALYSIS-II

Course Objectives:

The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. To understand the concept of static and kinematic indeterminacy
2. To learn various method of analyzing indeterminate structures
3. To draw influence lines for indeterminate structure
4. To understand the concept of Plastic Analysis
5. To apply the concept of FEM.

Course Outcomes:

1. To learn the degree of freedom in structures.
2. To know the analysis of indeterminate structure
3. To draw the ILD of various structure
4. To learn plastic hinge application
5. Analyze the structure using FEM techniques.

Module	Topics	No. of Lectures
I	Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, method of Consistent Deformation, Slope Deflection method, Moment Distribution method.	[8]
II	Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust.	[8]
III	Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders.	[8]
IV	Basics of Force and Displacement Matrix methods for beams, and frames.	[6]
V	Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames.	[5]

Suggested Readings:

Text & Reference Books:

1. Jain, A. K., Advanced Structural Analysis, Nem Chand & Bros., Roorkee.
2. Hibbeler, R.C. Structural Analysis", Pearson Prentice Hall, Sector 62, Noida-201309
3. C. S. Reddy "Structural Analysis", Tata Mc Graw Hill Publishing Company Limited,
4. Wang, C. K. " Intermediate Structural Analysis", TMH Book Publishing Company
5. ThandavaMoorthy, T.S., "Structural Analysis" Oxford University Press, New Delhi

E Learning links :

1. https://nptel.ac.in/courses/105/105/105105109/
2. https://nptel.ac.in/courses/105/106/105106050/

STRUCTURAL ANALYSIS-II

Course Objectives:

The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. To understand the concept of static and kinematic indeterminacy
2. To learn various method of analyzing in determinate structures
3. To draw influence lines for indeterminate structure
4. To understand the concept of Plastic Analysis
5. To apply the concept of FEM.

Course Outcomes:

1. To learn the degree of freedom in structures.
2. To know the analysis of indeterminate structure
3. To draw the ILD of various structure
4. To learn plastic hinge application
5. Analyze the structure using FEM techniques.

Module	Topics	No. of Lectures
I	Analysis of fixed beams, Continuous beams and simple frames with and without Translation of joint, method of Consistent Deformation, Slope Deflection method, Moment Distribution method.	[8]
II	Analysis of two hinged arches; parabolic, semicircular and segmental arches. Analysis of two hinged arches supported at same & different level	[8]
III	Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Influence line diagrams for arches; horizontal thrust, Bending Moment, radial shear and normal thrust	[8]
IV	Analysis of Indeterminate beam & Frames By of Force and Displacement Matrix methods.	[8]
V	Basics of Plastic Analysis; Introduction, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames.	[8]

Suggested Readings:

Text & Reference Books:

1. Jain,A.K.,Advanced Structural Analysis,NemChand &Bros.,Roorkee.
2. Hibbeler,R.C.Structural Analysis",PearsonPrenticeHall,Sector62,Noida-201309
3. C.S.Reddy"StructuralAnalysis",TataMcGrawHillPublishingCompany Limited,
4. Wang,C.K."IntermediateStructural Analysis",TMHBookPublishingCompany
5. ThandavaMoorthy,T.S.,"StructuralAnalysis"OxfordUniversityPress,NewDelhi

ELearninglinks:

1. https://nptel.ac.in/courses/105/105/105105109/
2. https://nptel.ac.in/courses/105/106/105106050/

WASTE WATER ENGINEERING

Course Objectives:

The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Understand various type of waste water
2. Design of waste water treatment plants
3. Various technique of designing treatment plant
4. To learn the disinfection techniques.

Course Outcomes:

1. To learn the types and parameters of waste water.
2. To know the physiochemical properties of waste.
3. To lean the treatment process of various units.
4. To learn the secondary treatment process.

Module	Topics	No. of Lectures
I	Introduction: Wastewater flow and its characteristics, Wastewater collection systems, Estimation and variation of wastewater flows. Problems of industrial wastewaters,	[8]
II	Sampling, Preliminary, primary, secondary and tertiary wastewatertreatmentprocesses. Theory and design of screens, grit chambers, sedimentation, coagulation, flocculation.	[8]
III	Physico-chemical and biological treatment strategies and their evaluation, Theory of activated sludge process(ASP), extended aeration systems, trickling filters (TF), Aerated lagoons, stabilization ponds, oxidation ditches, sequential batch reactor, rotating biological contactor, etc., Mass balancing in ASP and TF and their design.	[8]
IV	Anaerobic treatment process, Effects of pH, temperature and other parameters on anaerobic treatment, Concept of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and upflow anaerobic sludge blanket (UASB) reactor.	[8]
V	Indian standards for disposal of treated wastewaters on land and in natural streams, Agricultural irrigation, Ground water recharge, Treated wastewater reclamationand reuse. Recent technologies of treatment.	[8]

Suggested Readings:

Text & Reference Books:

1. Peavy, Howard S., Rowe, Donald R, George, "Environmental Engineering" McGraw Hill Education.
2. Garg, SK: Water Supply Engineering (Environmental Engineering Vol. – I)
3. Nathanson, Schneider, "Basic Environmental Technology Pollution Pearson Education.
4. Metcalf & Eddy, "Wastewater Engineering: Treatment & Reuse", Tata Mc-Graw Hill
5. Garg, S.K. "Environmental Engineering Vol. II (Sewage Disposal and Air Pollution Engineering)"
6. Rao, M.N. & Dutta, A.K. "Wastewater Treatment", Oxford & IBH Publishing.

E Learning links :

1. https://nptel.ac.in/courses/105/105/105105178/
2. https://nptel.ac.in/courses/105/106/105106119/

GEOTECHNICAL ENGINEERING LAB

NOTE: Student will have to perform any 8 out of the listed experiments below:

List of Experiments

1. Determination of water content of a given moist soil sample by
   (i) oven drying method, (ii) pycnometer method.
2. Determination of specific gravity of a given soil sample by
   (i) density bottle, (ii) pycnometer method.
3. Determination of in situ dry density of soil mass by
   (i) core-cutter method, (ii) sand replacement method.
4. Determination of relative density of a given soil sample.
5. Determination of complete grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.
6. Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).
7. Determination of shear strength of soil by Direct shear test.
8. Determination of compaction characteristics (OMC & MDD) of a given soil sample.
9. Determination of permeability of a remoulded soil sample by constant head &/or falling head method.
10. Determination of consolidation characteristics of a remoulded soil sample by an odometer test.
11. Determination of shear strength characteristics of a given soil sample by U/U test from Tri-axial Compression Machine.
12. Retrieving soil samples and conducting SPT tests by advancing boreholes through hand-held auger.

ENVIRONMENTAL ENGINEERING LAB
NOTE: Student will have to perform any 8 out of the listed experiments below:
List of Experiments
1. Determination of turbidity and conductivity. **2.** Determination of pH, alkalinity and acidity. **3.** Determination of hardness and chlorides. **4.** Measurement of SPM and PM10 with high volume sampler. **5.** Measurement of sound level with sound level meter. **6.** Determination of total suspended and dissolved solids. **7.** Determination of BOD. **8.** Determination of COD. **9.** Determination of fluoride. **10.** Determination of optimum dose of coagulants by Jar Test Apparatus. **11.** Field Visit of Water/ Sewage Treatment Plant of a nearby area.

COMPUTER ADDED DESIGN LAB
NOTE: Student will have to perform the listed experiments below:
List of Experiments
1. Working on Latest Version of ANALYSIS SOFTWARE LIKE ANSYS , ADINA , NISA, MATLAB/AUTO CAD-3D 2. Working on Latest Version of DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP 3. Working on Latest Version of GEOTECHNICAL SOFTWARES like GEO-5 / PLAXIS

STRUCTURAL ~~ANLA~~ ANALYSIS LAB

~~STRUCTURE ANALYSIS LAB~~
NOTE: Student will have to perform any 8 out of the listed experiments below:
List of Experiments
1. To determine Flexural Rigidity (EI) of a given beam 2. To verify Maxwell's Reciprocal theorem. 3. To find horizontal thrust in a three-hinged arch and to draw influence line diagrams for Horizontal Thrust end Bending moment. 4. To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment. 5. To find deflection of curved members. 6. To find bar forces in a three members structural frames with pin jointed bar 7. To find Critical load in Struts with different end conditions. 8. To find deflections in Beam having unsymmetrical bending

Certificate Course
NOTE: Student will have to take part in skill based certificate course

DESIGN OF STEEL STRUCTURES

Course Objectives:

The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Analysis and design of steel structure.
2. Design of bolted and welded connections.
3. Analysis and design of axially loaded tension member, axially loaded column,
4. Design of lacing and batten system, design of slab base foundation.

Course Outcomes:

1. To know the basic properties of steel and to understand the behaviour
2. To know the different steel structure analysis and design.
3. To know the design and analysis of angle sections, bolted & welded connection.
4. To understand concepts of strength and stiffness considerations.
5. Analyze, and design the riveted and bolted connections.

Module	Topics	No. of Lectures
I	Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel,Stress-Strain Curve for Mild Steel, Rolled Steel Sections, , Local Buckling of Plate Elements. Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability.	[8]
II	Bolted Connections, Types of Bolts, Failure of Bolted Joints, Specification for Bolted Joints,Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Design of eccentric bolted connections. Simple Welded Connections: Introduction, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Welds, Design of Fillet Welds, Design of eccentric welded connections.	[8]
III	Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design.	[8]
IV	Introduction, Effective Length, Slenderness Ratio (λ), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns(Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back,Splices,Design of Column Bases.	[6]
V	Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams. Bearing Plates, Effect of Holes in Beam, Introduction to Plate Girder, Introduction to Gantry Girder	[5]

Suggested Readings:

Text & Reference Books:

1. Design of Steel Structures by N.Subramanian, Oxford UniversityPress
2. Limit State Design Design of Steel Structures by KSSairam, Pearson Education
3. Design of Steel Structures by SRamamurtham, Dhanpat Rai PublishingCompany
4. Design of Steel Structures by S.K. Duggal,Tata McgrawHill.
5. Steel Structures by Robert Englekirk. HohnWiley & sonsinc.
7. Design of steel structures by WillamT Segui,CENGAGE Learning
8. Structural Steel Design By DMacLaughlin,CENGAGELearning

E Learning links :

1. https://nptel.ac.in/courses/105105162/

DESIGN OF CONCRETE STRUCTURES-II

Course Objectives:

The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Understand and design Flat slab
2. Understand various components of retaining wall and design it
3. Learn the design of liquids retaining structure
4. Understand the concept of prestress

Course outcomes:

1. To learn the design of flat slab.
2. To know the forces acting on retaining wall .
3. To lean the design of various liquid retaining structure.
4. To learn the process off pre stressing.

Module	Topics	No. of Lectures
I	Flat slab: nature of stresses in flat slab with or without drop, coefficients for design of flat slab, Reinforcement in flat slab (IS Code Method).	[8]
II	Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of cantilever retaining wall by Limit State Method, Concept of counterfort Retaining wall	[8]
III	Introduction, Design Philosophy, Type of Tanks, Components of Tank,Design & detailing of Underground Rectangular and Circular Water Tank	[8]
IV	Design & Detailing of Elevated circular & rectangular RC water tanks., Design & Detailing Intz Tank	[8]
V	Prestressing: Advantage of pre-stressing, Methods of pre-stressing, Losses in pre-stress, Analysis of simple prestressed rectangular section.	[8]

Suggested Readings:

Text & Reference Books:

1. Reinforced Concrete Design by S. U. Pillai & D. Menon, T.M.H., Publication
2. Reinforced Concrete -Limit State Design by A. K. Jain, Nem Chand & Bros., Roorkee.
3. Reinforced Concrete Vol. - II by H.J. Shah, Charotar Publisher, Gujarat.
4. RCC Designs (Reinforced Concrete Structures) by B.C. Punmia, Ashoka Kumar Jain and Arun Kumar Jain, Laxmi Publishers, New Delhi.
5. Reinforced Concrete Structures by R. Park and Pauley.
6. Bureau of Indian Standard IS 456-2000
7. Reinforced Concrete Structures by R. Park and Pauley.

E Learning links :

1. https://nptel.ac.in/courses/105/105/105105105/

INTEGRATED WASTE MANAGEMENT

Course Objectives:

The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. To understand the fundamental and municipal solid waste manage management systems
2. To apply various disposal methods of solid waste
3. Clear idea about management and disposal of demolition waste
4. Develop criteria to classify E waste

Course Outcomes:

1. To know about the classification of waste.
2. To know the disposal of various waste .
3. To learn the demolition waste and disposal.
4. To learn the E waste and their disposal.

Module	Topics	No. of Lectures
I	Introduction: Solid Waste Management- Definition, Concept of 4Rs (reduce, reuse, recycle and recover) of waste management, Elements and Issuesof a waste management system, Integrated Waste Management Hierarchy. Waste-to-Energy and Land filling. Review of waste management under Swachh Bharat Mission and Smart Cities Program.	[6]
II	Municipal Solid Waste: Waste Composition and Quantities, Collection Transportation, Segregation, and Processing.	[8]
III	Disposal of Municipal Solid Waste: Landfill, Biochemical Processes and Composting, Energy Recovery from Municipal Solid Waste. Municipal Solid Waste (MSW) Rules 2016	[6]
IV	Construction and Demolition (C&D) Waste Management: Overview, Components; C&D Waste Management Rules 2016, Beneficial Reuse of C & D Waste Materials	[6]
V	Electronic Waste (E-Waste) Management – Issues and Status in India and Globally, E-Waste Management Rules 2016 and Management Challenges.Hazardous Wastes: Definition, Classification, Risk assessment, Transportation of hazardous waste, Current Management Practices: Environmental audit, Containment, Remedial alternatives.	[6]

Suggested Readings:

Text & Reference Books:

1. George Tchobanoglous, Hilary Theisen and Samuel A Vigil, Integrated Solid Waste management, Tata McGraw Hill
2. Ramachandra T.V., Management of Municipal Solid Waste, 2009; by The Energy and Resource Institute, TERI
3. Sasikumar, K, Gopi Krishna, Sanoop, Solid Waste Management; 2009, PHI.
4. Manual on Solid Waste Management, prepared by The Central Public Health and Environmental Engineering Organization(CPHEEO), India
5. Construction and Demolition Waste Management Rules, 2016, MoEF&CC

E Learning links :

1. https://nptel.ac.in/courses/105/105/105105160/

TRANSPORTATION ENGINEERING

Course Objectives:

The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Understand the principles and practices in transportation Engineering
2. To learn transportation planning and land use planning, economics, and master plan.
3. Identify and solve transportation problems.
4. To learn the design process of curves and signals
5. To learn the design of flexible and rigid pavements

Course Outcomes:

1. To learn types of roads.
2. To analyze the problems of SSD and OSD .
3. To learn the design of signals.
4. To learn the application of road design.

Module	Topics	No. of Lectures
I	Introduction: Role of Transportation, Modes of Transportation History of road development, Road types and pattern, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, Factors Controlling the alignment, Survey for route location.	[6]
II	Geometric Design (IRC:73-Latest revision): Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves.	[8]
III	Traffic Engineering: Traffic Characteristics, Traffic studies on flow, speed, travel time - delay and O-D study, PCU, peak hour factor, parking study, accident study and analysis, traffic capacity, density, traffic control devices: signs, Island, signal design by Webster's and IRC method . Intersection at grade and grade separated intersections,	[6]
IV	Highway Materials: Properties of Subgrade, Aggregates & Binding materials, Various tests and specifications, Design of Highway Pavement : Types of Pavements, Design factors, Design of bituminous paving mixes; Design of Flexible Pavement by CBR method (IRC : 37- Latest revision), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design (IRC:58-2015)	[6]
V	Highway Construction: Construction of Subgrade, Water Bound Macadam (WBM), Wet mix macadam (WMM), Granular Sub Base (GSB),Tack Coat, Prime Coat, Seal Coat, Surface Dressing, Bituminous Macadam (BM), Semi dense bituminous concrete (SDBC) and Bituminous concrete, Dry lean concrete (DLC), Cement Concrete (CC) road construction, Roller Compacted Concrete Roads	[6]

Suggested Readings:

Text & Reference Books:

1. Khanna S. K., Justo C.E.G, &Veeraragavan, A. "Highway Engineering", Nem Chand and Bros., Roorkee.
2. Khanna S. K., Justo C.E.G, &Veeraragavan A., "Highway Materials andPavement Testing", Nem Chand and Bros., Roorkee
3. LR Kadiyali, Transportation Engineering, Khanna Publication

E Learning links :

1. https://nptel.ac.in/courses/105/101/105101087/
2. https://nptel.ac.in/courses/105/105/105105107/

TRANSPORTATION ENGINEERING LAB
NOTE: Student will have to perform any 8 out of the listed experiments below:
List of Experiments
1. To Determine the Crushing Value of Coarse Aggregates. 2. To Determine the Impact Value of Coarse Aggregates. 3. To determine the Flakiness Index and Elongation Index of Coarse Aggregates. 4. To determine the Los Angeles Abrasion Value of Coarse Aggregates. 5. To determine the Stripping Value of Coarse Aggregates. 6. To determine the penetration Value of Bitumen. 7. To determine the Softening Point of Bituminous material. 8. To determine the Ductility Value of Bituminous material. 9. To determine the Flash and Fire Point of Bituminous material

STAAD LAB
NOTE: Student will have to perform the listed experiments below:
List of Experiments
1. Working on Latest Version of ANALYSIS SOFTWARE LIKE ANSYS , ADINA , NISA, MATLAB/AUTO CAD-3D 2. Working on Latest Version of DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP 3. Working on Latest Version of GEOTECHNICAL SOFTWARES like GEO-5 / PLAXIS

DEPARTMENTAL ELECTIVES

S.NO	SUBJECT	SUBJECTCODE
1.	Ground Improvement Techniques	DCE 001
2.	Environmental Geotechnology	DCE 002
3.	Advanced Foundation Engineering	DCE 003
4.	Prestressed Concrete	DCE 004
5.	Bridge Engineering	DCE 005
6.	Groundwater Hydrology	DCE 006
7.	Water Resources systems, Analysis, Planning & Management	DCE 007
8.	Remote Sensing and GIS	DCE 008
9.	Ecology & Environmental Impact Assessment	DCE 009
10.	Water Distribution and Wastewater Collection System Design	DCE 010
11.	Air and Water Quality Modelling	DCE 011
12.	Environmental Planning and Management	DCE 012
13.	Industrial Pollution Control	DCE 013
14.	Advanced Environmental Biotechnology	DCE 014
15.	Management of Water Resources	DCE 015
16.	Geo-environmental Engineering	DCE 016
17.	Engineering Behavior of Soil	DCE 017
18.	Analysis of Transportation System	DCE 018
19.	Transportation Environment Interaction	DCE 019
20.	Rehabilitation, Reconstruction and Recovery	DCE 020
21.	Disaster Resilient Structures and Retrofitting	DCE 021
22.	Disaster Response and Preparedness	DCE 022
23.	Disasters and Special Structure	DCE 023
24.	Man-made and Biological Disasters-Detection and Mitigation	DCE 024
25.	Hydroinformatics	DCE 025
26.	Zero Energy Buildings	DCE 026
27.	Carbon Audit and Management	DCE 027
28.	Energy Generation from Waste	DCE 028
29.	Ocean Renewable Energy	DCE 029
30.	Zero Emission Vehicles	DCE 030
31.	Safety in Engineering Industry	DCE 031
32.	TQM & TPM	DCE 032
33.	Global Disaster Scenario and Type of Natural Disaster	DCE 033
34.	Green Building & Energy Management	DCE 034
35.	Automation in Construction Industry	DCE 035
36.	Construction Techniques of Deep Foundations	DCE 036
37.	Construction Techniques of Steel and Concrete Composite Structures	DCE 037
38.	Estimating Tendering & Bidding	DCE 038
39.	Formwork for Concrete Structure	DCE 039
40.	Construction Economics	DCE 040
41.	Infrastructure Valuation	DCE 041
42.	Structural Masonary	DCE 042
43.	Engineering Geology	DCE 043
44.	Environmental Sciences	DCE 044
45.	Cyber Security	DCE 045