JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For

B. TECH CIVIL ENGINEERING

(Applicable for batches admitted from 2019-2020)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

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III YEAR: I- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	PC501	Structural Analysis	3	0	0	3
2	PC502	Concrete Technology	2	0	0	2
3	PC503	Water Resources Engineering - I	3	0	0	3
4	PC504	Environmental Engineering - II	3	0	0	3
5	PE501	Program Elective – I	3	0	0	3
6	OE501	Open Elective – I	3	0	0	3
7	PC506	Concrete Technology Lab	0	0	3	1.5
8	PC507	Surveying Field Work - II	0	0	3	1.5
		Total Credits				**20**

III YEAR: II- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	PC601	Design & Drawing of Reinforced Concrete Structures	3	0	0	3
2	PC602	Water Resources Engineering – II	3	0	0	3
3	PC603	Geotechnical Engineering - I	3	0	0	3
4	HS601	Managerial Economics &Financial Analysis	3	0	0	3
5	PE601	Program Elective – II	3	0	0	3
6	OE601	Open Elective – II	3	0	0	3
7	PC604	CAD Lab	0	0	3	1.5
8	PC605	Environmental Engineering Lab	0	0	3	1.5
9	PR601	Socially Relevant Project	0	0	2	1
10	MC601	Employability Skills	0	0	2	0
		Total Credits				**22**

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Open Electives	**Professional Elective-I**	**Professional Elective-II**	**Professional Elective-III**	**Professional Elective-IV**	**Professional Elective-V**
a) Disaster Management	a) Repair & Rehabilitation of Buildings	a) Pre-stressed Concrete	a) Bridge Engineering	a) Finite Element Methods	a) Advanced Structural Analysis
b) Environmental Pollution & Control	b) Environmental Impact Assessment	b) Watershed Management	b) Industrial Waste Water Treatment	b) Design & Drawing of Irrigation Structures	b) Urban Hydrology
c) Elements of Civil Engineering	c) Reinforced Soil Structures	c) Advanced Foundation Engineering	c) Earth & Rock-fill Dams	c) Soil Dynamics and Machine Foundations	c) Ground Improvement Techniques
d) Green Technology	d) Traffic Engineering	d) Urban Transportation Planning	d) Intelligent Transportation Systems	d) Road Safety Engineering	d) Pavement Management Systems
e) Smart Cities	e) Construction Technology & Management	e) Architecture and Town Planning	e) Building Services	e) Disaster Management & Mitigation	e) Low-cost Housing
f) Project Management				f)SWAYAM / NPTEL /MOOCS COURSES (12 weeks duration)	f) SWAYAM / NPTEL /MOOCS COURSES (12 weeks duration)
g) Traffic Safety					
h) Geo-Spatial Technologies					
i) Waste Water Treatment					

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III Year – I Semester		L	T	P	C
		3	0	0	3
STRUCTURAL ANALYSIS					

Course Learning Objectives:

- To give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams and continuous beams due to various loading conditions.
- To impart concepts of Bending Moment and Shear force for beams with different boundary and loadingconditions
- The procedure for development of slope deflection equations and to solve application to continuous beams with and without settlement ofsupports.
- The concepts of moving loads and influence lines are imparted for assessment of maximum SF and BM at a given section when loads of varying spans rolling loads of Pratt and Warrentrusses.

Course Outcomes:

Upon successful completion of this course the student will be able to,

- Distinguish between the determinate and indeterminatestructures.
- Identify the behaviour of structures due to the expected loads, including the moving loads, acting on thestructure.
- Estimate the bending moment and shear forces in beams for different fixity conditions.
- Analyze the continuous beams using various methods -, three moment method, slope deflection method, energytheorems.
- Draw the influence line diagrams for various types of moving loads on beams/bridges.
- Analyze the loads in Pratt and Warren trusses when loads of different types and spans are passing over thetruss.

Syllabus:

UNIT – I Propped Cantilever and Fixed beams

Propped Cantilevers: Introduction -Degree of Static and Kinematic indeterminacy of Beams, frames and trusses. Analysis of propped cantilevers-shear force and Bending moment diagrams-Elastic curve - Deflection of propped cantilever beams.
Fixed Beams – Introduction to statically indeterminate beams with U. D. load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - shear force and Bending moment diagrams-Elastic curve - Deflection of fixed beams including effect of sinking of support, effect of rotation of asupport.

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UNIT – II Analysis of Continuous beams and Portal Frames

Slope-Deflection Method: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports. Analysis of Single bay single storey portal frames without sway. Shear force and Bending moment diagrams, Elastic curve.

Moment distribution method: Application to continuous beams with and without settlement of supports. Analysis of Single bay single storey portal frames without sway. Shear force and Bending moment diagrams, Elastic curve.

UNIT III Analysis of Pin-Jointed Plane Frames: Determination of Forces in members of plane pin-jointed (determinate) perfect trusses by (i) method of joints (ii) method of sections and (iii) Method of Tension coefficients. Analysis of various types of cantilever and simply supported trusses by method of joints, method of sections and Tension coefficients.

UNIT – IV Moving Loads And Influence Lines: Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load, U. D load longer than the span, U. D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length.
Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a sections, single point load, U.D. load longer than the span, U.D. load shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

UNIT – V MATRIX METHODS OF ANALYSIS: Introduction to Flexibility and Stiffness matrix methods of analyses using 'system approach' upto three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods - Analysis of pin-jointed determinate plane frames using flexibility and stiffness methods- Analysis of single bay single storey portal frames using only stiffness method - Shear force and bending moment diagrams - Elastic curve.

Text Books:

1. Structural Analysis by R.C. Hibbeler, Pearson, NewDelhi.
2. Basic Structural Analysis, K U Muthu et. al., IK International Publishing house pvt. Ltd.

References

1. Indeterminate Structural Analysis, K U Muthu et. al., IK International Publishing house pvt. Ltd.
2. Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna
3. Publishers, New Delhi.
4. Mechanics of Structures Vol – II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
5. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt. Ltd.
6. Structural Analysis: A Matrix Approach, G.S.Pandit and S.P.Gupta, Mc Graw Hill Pvt. Ltd.

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		2	0	0	2
CONCRETE TECHNOLOGY					

Course Learning Objectives:

- To learn concepts of Concrete production and behaviour in various environments.
- To learn test procedures for determination of properties ofconcrete.
- To understand durability properties of concrete in various environments.

Course Outcomes:

Upon successful completion of this course, student will be able to

- understand basic concepts of concrete.
- realize importance of quality ofconcrete.
- familiarize basic ingredients of concrete and their role in concrete and their behaviour in thefield.
- test fresh concrete properties and hardened concreteproperties.
- evaluate ingredients of concrete through lab tests. design concrete mix by ISmethod.
- familiarize basic concepts of special concrete and their production and applications. understand the behaviour of concrete in variousenvironments.

UNIT I : Ingredients of Concrete :

Portland cement – Chemical composition – Hydration, Setting times, Fineness, Structure – Tests on cement for physical properties – Grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume.

Aggregates: Classification – Particle shape & texture – Bond, strength & other mechanical properties – Specific gravity, Bulk density, porosity, adsorption & moisture content – Bulking of sand –Deleterious substance – Soundness – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded and well graded aggregate as per relevant IS code – Maximum aggregate size. Quality of mixingwater.

UNIT – II : Mix Design and Fresh Concrete

Mix Design: Factors affecting mix proportions – Durability of concrete
– Quality Control of concrete – Statistical methods – Acceptance criteria – Concepts Proportioning of concrete mixes by IS method.

Fresh Concrete: Production of Concrete–mix proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete - Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete,

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Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete,Shotcrete

UNIT – III : Hardened Concrete: Water - Cement ratio – Abram's Law – Gel space ratio – strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests –Splitting tests – Non-destructive testing methods – code provisions forNDT.

UNIT – IV : Elasticity, Creep & Shrinkage, Modulus of elasticity, Dynamic modulus of elasticity, Poisson's ratio, Creep of concrete and factors influencing creep, Relation between creep & time, Nature of creep, Effects of creep – Shrinkage –types of shrinkage.

UNIT – V : Special Concretes: Ready mixed concrete, Shotcrete, Light weight aggregate concrete, Cellular concrete, No-fines concrete, High density concrete, Fibre reinforced concrete, Different types of fibres, Factors affecting properties of FRC, Polymer concrete, Types of Polymer concrete, Properties of polymer concrete, High performance concrete–Self compacting concrete, SIFCON, self healing concrete.

Text Books:

1. Concrete Technology, M. S. Shetty. – S. Chand & Company
2. Concrete Technology, A. R. Santhakumar, Oxford University Press, NewDelhi

References :

1. Properties of Concrete, A. M. Neville – Pearson – 5thedition
2. Concrete, Microstructure, Properties and Materials by P.K.Mehta and Moterio, McGraw Hill
3. Concrete Technology, M.L. Gambhir. – Tata Mc. Graw Hill Publishers, NewDelhi

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III Year – I Semester		L	T	P	C
		3	0	0	3
WATER RESOURCES ENGINEERING - I					

Course Learning Objectives:

The course is designed to

- Understand the hydrologic cycle and its relevance to Civilengineering
- make the students understand physical processes in hydrology and, components of the hydrologiccycle
- appreciate concepts and theory of physical processes andinteractions
- learn measurement and estimation of the components hydrologiccycle.
- provide an overview and understanding of Unit Hydrograph theory and itsanalysis
- understand flood frequency analysis, design flood, floodrouting
- appreciate the concepts of groundwater movement and wellhydraulics

Course Outcomes

At the end of the course the students are expected to

- be able to quantify major hydrologic components and apply key concepts to several practical areas of engineering hydrology and related designaspects
- develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulicstructures.
- ability to develop design storms and carry out frequencyanalysis
- be able to determine storage capacity and life ofreservoirs and develop unit hydrograph and synthetic hydrograph.
- be able to estimate flood magnitude and carry out flood routing.
- be able to determine aquifer parameters and yield ofwells.
- Ability to develop the hydrological models.

UNIT I

Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.

Precipitation: Types and forms, measurement, raingauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm

UNIT-II Abstractions from Precipitation: Initial abstractions.
Evaporation: factors affecting, measurement, reduction

Evapotranspiration: factors affecting, measurement, control

Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices, inter

flow

UNIT-III Runoff: Catchment characteristics**,** Factors affecting runoff, components, computation-empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.

Hydrograph analysis: Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

Hydrological models: Rainfall – Run off modeling, conceptual methods.

UNIT-IV Floods: Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management.

Flood Routing: Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

UNIT-V Groundwater: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, Dupuit's equation-steady radial flow to wells in confined and unconfined aquifers, yield of a open well-recuperation test.

Text Books:

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., (2013), NewDelhi
2. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain and Arun Kumar Jain, Lakshmi Publications (P)Ltd.
3. Sharma , S.K (2016) " Irrigation Engineering", S.chand publisher New Delhi.

References:

1. Engineering Hydrology Subramanya, K, Tata McGraw-Hill Education PvtLtd, (2013),New Delhi.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.
3. Chow , V.T.Maidment,D.K and Mays L.W(2011). "Applied hydrology",Tata McGraw Hills Education Pvt ltd, New Delhi.
4. Mays L.W, Wiley India Pvt. Ltd,(2013). "Water Resources Engineering" Wiley India Pvt.Ltd.

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		3	0	0	3
ENVIRONMENTAL ENGINEERING - II					

Course Learning Objectives:

The objective of this courses:

- Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city
- Provide knowledge of characterization of wastewater generated in a community
- Impart understanding of treatment of sewage and the need for its treatment.
- Summarize the appurtenance in sewerage systems and the irnecessity
- Teach planning, and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems
- Effluent disposal method and realise the importance of regulations in the disposal of effluents in rivers

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

- Plan and design the sewerage systems by estimating the flow
- Design of Plumbing for an apartment, Gated community or Hotels or Individual houses and Select the appropriate appurtenances in the sewerage systems
- Estimation of BOD and COD and Suggest a suitable disposal method with respect to effluent standards, and Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river
- Analyze sewage and design suitable treatment system for sewage treatment for a village/City.
- Design of sewage treatment systems like Septic tank soak pit system and FAB reactor for buildings and understanding tertiary treatment of sewage.

UNIT – I: **Introduction to Sanitation** – Systems of sanitation – relative merits & demerits – collection and conveyance of wastewater – sewerage – classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers - Hydraulics of sewers and storm drains– design of sewers.

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UNIT – II: **Sewer appurtenances** – cleaning and ventilation of sewers. **Pumping of wastewater**: Pumping stations – location – components– types of pumps and their suitability with regard to wastewaters.
House Plumbing: Systems of plumbing-sanitary fittings and other accessories– one pipe and two pipe systems – Design of drainage in Gate communities, Apartments and Hotels.

UNIT – III: **Sewage characteristics** – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination-Measurement of BOD and COD – BOD equations. ThOD and Nirogen Oxygen Demand. **Ultimate Disposal of sewage**: Methods of disposal – disposal into water bodies-Oxygen Sag Curve- Disposal into sea, disposal on land, Crown corrosion, Sewage sickness. Effluent standards.

UNIT – IV: Treatment of Sewage: Primary treatment- Screens- Grit chambers- Grease traps– floatation– Sedimentation – Design of preliminary and primary treatment units. **Secondary treatment**: Aerobic and anaerobic treatment process-comparison. **Suspended growth process**: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes, Oxidation ponds, Aerated Lagoons. **Attached Growth Process:** Trickling Filters – mechanism of impurities removal – classification – design, operation and maintenance problems. RBCs, Fluidized bed reactors.

UNIT V: Miscellaneous Treatment Methods: Nitrification and Denitrification-Removal of Phosphates – UASB–Membrane reactors- Integrated fixed film reactors. Anaerobic Processes: Septic Tanks and Imhoff tanks- working Principles and Design– Reuse and disposal of septic tank effluent, FAB Reactors. **Bio-solids (Sludge) management**: Characteristics-SVI, handling and treatment of sludge-thickening – anaerobic digestion of sludge, Sludge Drying Beds. Centrifuge. Case studies.

Text Books

1. Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, Tata McGraw-Hill edition.
2. Elements of Environmental Engineering, K. N. Duggal, S. Chand & Company Ltd. New Delhi,2012.

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References

1. Industrial Water and Wastewater Management, K.V.S.G. Murali Krishna.
2. Environmental Engineering, Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi,1985
3. Wastewater Treatment for Pollution Control and Reuse, Soli. J Arceivala, Sham R Asolekar, Mc-GrawHill, New Delhi; 3rdEdition
4. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, Garg, S. K., Khanna Publishers
5. Sewage treatment and disposal, P. N. Modi & Seth.
6. Environmental Engineering, Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier,2003
7. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

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		3	0	0	3
PROGRAM ELECTIVE – I a). Repair & Rehabilitation of Buildings					

Course Objective:

a. Study the assessment, maintenance and repair techniques of concrete structures.
b. Different case studies are analyzed to define the best strategy to maintain and repair the structure.
c. Identify scope of rehabilitation work for dilapidated / obsolete buildings.
d. Identify and apply appropriate structural and construction technologies to rectify maintenance problems.
e. Prepare short and long term maintenance plans.
f. Identify / apply appropriate standards and statutory controls for maintenance and rehabilitation work. Understand the use of Building Information Modelling (BIM) for maintenance planning.

Course Outcomes:

Upon completion of the course, the student will be able to

1. Recognize the mechanisms of degradation of concrete structures and to design durable concrete structures.
2. Conduct field monitoring and non-destructive evaluation of concrete structures.
3. Design and suggest repair strategies for deteriorated concrete structures including repairing with composites.
4. Understand the methods of strengthening methods for concrete structures
5. Assessment of the serviceability and residual life span of concrete structures by Visual inspection and in situ tests
6. Evaluation of causes and mechanism of damage
7. Evaluation of actual capacity of the concrete structure Maintenance strategies
8. Repair / Rehabilitate / Strengthening techniques by using traditional and advanced materials and techniques.

Syllabus

UNIT-I

Materials for repair and rehabilitation -Admixtures- types of admixtures- purposes of using admixtures- chemical composition- Natural admixtures- Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates- Non destructive evaluation: Importance- Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo methods- Ultrasound pulse velocity methods- Pull out tests.

UNIT- II

Strengthening and stabilization- Techniques- design considerations- Beam shear capacity strengthening- Shear Transfer strengthening- stress reduction techniques- Column strengthening- flexural strengthening- Connection stabilization and strengthening, Crack stabilization.

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UNIT- III

Bonded installation techniques- Externally bonded FRP- Wet layup sheet, bolted plate, near surface mounted FRP, fundamental debonding mechanisms-intermediate crack debonding- CDC debonding-plate end debonding- strengthening of floor of structures.

UNIT- IV

Fibre reinforced concrete- Properties of constituent materials- Mix proportions, mixing and casting methods-Mechanical properties of fiber reinforced concrete- applications of fibre reinforced concretes-Light weight concrete- properties of light weight concrete- No fines concrete- design of light weight concrete- Flyash concrete- Introduction- classification of flyash- properties and reaction mechanism of flyash- Properties of flyash concrete in fresh state and hardened state- Durability of flyash concretes.

UNIT- V

High performance concretes- Introduction- Development of high performance concretes- Materials of high performance concretes- Properties of high performance concretes- Self Consolidating concrete-properties- qualifications.

REFERENCES:

1. Concrete technology- Neville & Brooks
2. Special Structural concrete- Rafat Siddique
3. Concrete repair and maintenance illustrated- Peter H Emmons
4. Concrete Technology-M S Shetty

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III Year – I Semester		L	T	P	C
		3	0	0	3
PROGRAM ELECTIVE – I b) Environmental Impact Assessment					

Course Learning Objectives:

The objective of this course is:

1. To impart knowledge on different concepts of Environmental Impact Assessment
2. To know procedures of risk assessment
3. To learn the EIA methodologies and the criterion for selection of EIA methods
4. To know pre-requisites for ISO 14001certification
5. To know the procedures for environmental clearances and audit
6. To appreciate the importance of stakeholder participation in EIA

Course Learning Outcomes

Upon successful completion of this course, the students will be able to:

a) Prepare EMP, EIS and EIA report, estimate cost benefit ratio of a project
b) Selection of an appropriate EIA methodology
c) Evaluation of impacts on environment
d) Evaluation of risk assessment
e) Know the latest acts and guidelines of MoEF & CC

SYLLABUS:

UNIT-I: Basic concepts of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination- life cycle analysis preparation of Environmental Base map- Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA, Environmental economics, Cost/benefit Analysis - EIS and EMP. Identification of activities-application of remote sensing and GIS for EIA.

UNIT-II: EIA Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods.

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area.

UNIT-III Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on



surface water environment, Generalized approach for assessment of Air pollution Impact.

UNIT-IV: Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation.
Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment- Advantages of Environmental Risk Assessment

UNIT-V EIA: MoEF&CC Acts, Notifications and Guidelines: Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO14000. Environmental compliance reports. Case studies and preparation of EIA statement for various Industries.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

References:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

2. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. Katania& Sons Publication., New Delhi.

3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

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III Year – I Semester		L	T	P	C
		3	0	0	3
PROGRAM ELECTIVE – I c). Reinforced Soil Structures					

Course objectives:

1. To understand the history and mechanism of reinforced soil
2. To know the various types of geo-synthetics, their functions and applications.
3. To enable the design of reinforced soil retaining structures.

Expected Outcomes:

The students will

a) Understand the history and mechanism of reinforced soil
b) Become aware about situations where geo-synthetics can be used.
c) Know about various types of geo-synthetics and their functions
d) Be able to do dimple design of reinforced soil retaining walls and reinforced earth beds.

Unit I:

Introduction -history –ancient and modern structures- Types of geo-synthetics, advantages, disadvantages. Functions of geo-synthetics and application areas where these functions are utilized such as in retaining walls, slopes, embankments, railway tracks, pavements etc. (general overview). Raw materials used for geo-synthetics, manufacturing process of woven and non-woven geotextiles, geo-membranes, geo-grids.

Unit II:

Properties of geo-synthetics. Creep and long term performance. Reinforced soil - Advantages and disadvantages. Fills, Types of facings, Factors affecting the performance and behaviour of reinforced soil. Mechanism of reinforcement action - Equivalent Confining Stress Concept, Pseudo Cohesion Concept, Concept of Expanding soil mass. – Simple problems.

Unit III:

Design and analysis of vertically faced reinforced soil retaining walls- External stability and Internal stability – Tie back wedge analysis and coherent gravity analysis with metallic strip and continuous geo-synthetic reinforcements. Assumptions, limitations and numerical problems. Construction methods of reinforced retaining walls. Geo-synthetics in pavements, function and benefits.

Unit IV:

Bearing capacity improvement using soil reinforcement – Binquet and Lee's analysis – Assumptions, failure mechanisms. Simple problems in bearing capacity. Geo-synthetics for short term stability of

embankments on soft soils. Natural geotextiles, Advantages and disadvantages, functions, erosion control- types of erosion control products, installation methods.

Unit V:

Prefabricated vertical drains along with design principles and installation method Concept of Geo-cells, Gabion Walls, encased stone columns, geo-composites, soil nailing, geo-tubes, geo-bags (only basic concepts), Natural geotextiles using coir and jute with relative advantages and disadvantages, application areas, application in landfills.

Text Books:

1. Jones, C.J.F.P. (1985). Earth reinforcement and soil structures. Butterworth, London.

2. Rao, G.V. (2007). Geo-synthetics – An Introduction. Sai Master Geo-environmental Services Pvt. Ltd., Hyderabad

References:

1. Koerner, R.M. (1999). Designing with Geosynthetics, Prentice Hall, New Jersey, USA, 4th edition.

2. Rao, G.V., Kumar, S. J. and Raju, G.V.S.S. (Eds.). Earth Reinforcement – Design and Construction. Publication No. 314, Central Board of Irrigation and Power, New Delhi, 2012.

3. Sivakumar Babu, G.L. (2006). An introduction to Soil reinforcement and geosynthetics. United Press (India) Pvt. Ltd. COURSE

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DEPARTMENT OF CIVIL ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
PROGRAM ELECTIVE – I d). Traffic Engineering					

Course Learning Objectives:

The objective of this course is:

1. To determine various components and characteristics of traffic.
2. To apply various traffic control devices and principles of highway safety.
3. To understand the detrimental effects of traffic on environment
4. To carry out highway capacity and level of service analysis.
5. To learn about intelligent vehicle highway systems.

Course Outcomes:

At the end of course, Students will be able to

a. Determine traffic speed, volume, travel time and density.
b. Design traffic signals
c. Determine highway capacity and LOS

UNIT- I

Components Of The Traffic System: Human-Vehicle–Environment System; characteristics of Road users, Vehicles, Highways and their classification; Traffic Studies:Inventories; Volume studies; Speed, Travel time and Delay studies; Intersection studies; Pedestrian studies; Parking studies; Accident studies.

UNIT- II

Traffic Characteristics: Microscopic and macroscopic flow characteristics: Time headways; Temporal, spatial and model flow patterns; Interrupted and Un interrupted traffic. Microscopic and macroscopic speed characteristics: Vehicular speed Trajectories; Speed characteristics – Mathematical distribution; Speed and travel time variations; Travel time and delay studies. Microscopic and Macroscopic density characteristics: Distance headway characteristics; Car-following theories; Density measurement techniques; Density contour maps.

UNIT- III

Traffic Control Devices & Highway Safety: Traffic signs & Markings; Signal Warrants; Signal phasing and Development of phase plans; Fixed and Vehicle activated signals; Webster method; ARRB method; Drew's Method; IRC method; Signal coordination; Area Traffic control. Accident characteristics – Road – Driver – Vehicle; Accident recording and Analysis; Highway Safety Improvement Program; Safety Audit.

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UNIT- IV

Highway Capacity And Level Of Service: Capacity and level of service; Factors affecting Capacity and LOS; Capacity of Rural Highways, Capacity of Urban Roads; HCM and IRC standards.

UNIT- V

Intelligent Vehicle – Highway Systems: Traffic surveillance and monitoring; IVHS programs, Role of IVHS, IVHS categories, Benefits and Costs of IVHS, Categories of ITS.

TEXT BOOKS

1. 'Traffic Engineering: Theory and Practice' by Pignataro LJ., Prentice hall, Inc
2. 'Traffic and Transport planning' by Kadiyali L.R., Khanna Publishers

REFERENCES:

1. 'Traffic Engineering' by Rogu P. Roess, Elena S. Prassas and William R. Mc Shane, Pearson India Education Services pvt. Ltd.
2. Traffic and Highway Engineering by Garber and Hoel, Cengage Learning India pvt. Ltd., Noida, New Delhi.

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III Year – I Semester		L	T	P	C
		3	0	0	3
PROGRAM ELECTIVE – I e). Construction Technology & Management					

Course Learning Objectives:

The objective of this course is:

1. to introduce to the student, the concept of project management including network drawing and monitoring
2. to introduce various equipment's like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to constriction.
3. to introduce the importance of safety in construction projects

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

a) appreciate the importance of construction planning
b) understand the functioning of various earth moving equipment
c) know the methods of production of aggregate products and concreting and usage of machinery required for the works.
d) apply the gained knowledge to project management and construction techniques

SYLLABUS:

UNIT- I Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical Path Method – Applications

UNIT -II Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

UNIT- III Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers

UNIT -IV Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers – selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing

UNIT –V Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering

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Text Books:

1. Construction Planning Equipment and Methods, Peurifoy and Schexnayder , Shapira, Tata Mcgraw hill
2. Construction Project Management Theory and Practice, Kumar NeerajJha (2011), Pearson.
3. Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.
4. Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

References:

1. Construction Project Management - An Integrated Approach, Peter Fewings , Taylor and Francis
2. Construction Management Emerging Trends and Technologies, Trefor Williams, Cengagelearning.
3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

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DEPARTMENT OF CIVIL ENGINEERING

III Year – I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
OPEN ELECTIVE – I (Choose any One out of Nine Courses)					

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III Year – I Semester		L	T	P	C
		0	0	3	1.5
CONCRETE TECHNOLOGY LAB					

Course Learning Objectives:

- To study basic properties ingredients of concrete, fresh and hardened concrete properties

Course Outcomes:

Upon successful completion of this course, student will be able to

- Determine consistency and fineness of cement.
- Determine setting times ofcement.
- Determine specific gravity and soundness ofcement.
- Determine compressive strength ofcement.
- Determine workability of cement concrete by compaction factor, slump and Vee – Beetests
- Determine specific gravity of coarse aggregate and fine aggregate by Sieve analysis.
- Determine flakiness and elongation index ofaggregates.
- Determine bulking ofsand.
- Understand non-destructive testing procedures on concrete.

List of Experiments: At least 10 experiments must be conducted (at least one for each property)

1. Determination of normal Consistency and fineness ofcement.
2. Determination of initial setting time and final setting time ofcement.
3. Determination of specific gravity and soundness ofcement.
4. Determination of compressive strength ofcement.
5. Determination of grading and fineness modulus of Coarse aggregate by sieveanalysis.
6. Determination of specific gravity of coarseaggregate
7. Determination of grading and fineness modulus of fine aggregate (sand) by sieve analysis.
8. Determination of bulking ofsand.
9. Determination of workability of concrete by compaction factormethod.
10. Determination of workability of concrete by slumptest
11. Determination of workability of concrete by Vee-beetest.
12. Determination of compressive strength of cement concrete and its young'smodulus
13. Determination of split tensile strength ofconcrete.
14. Non-Destructive testing on concrete (fordemonstration)

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List of Equipment:

1. Standard set of sieves for coarse aggregate and fineaggregate
2. Vicat'sapparatus
3. Specific gravitybottle.
4. Lechatlier'sapparatus.
5. Slump TestApparatus.
6. Compaction Factor TestApparatus.
7. Vee- Bee testapparatus
8. Longitudinal compresso-meter
9. Universal testing Machine (UTM)/Compression Testing Machine(CTM).
10. Rebound hammer, Ultrasonic pulse velocity machine, micro cover meteretc.

Reference:

1) Concrete Manual by M.L.Gambhir

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III Year – I Semester		L	T	P	C
		0	0	3	1.5
SURVEYING FIELD WORK – II					

List of Experiments

1. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of repetitionmethod.
2. Theodolite Survey: Finding the distance between two inaccessiblepoints.
3. Theodolite Survey: Finding the height of farobject.
4. TacheomatricSurvey:Heightsanddistanceproblemsusingtachometric principles.
5. One Exercise on Curvesetting.
6. One Exercise oncontours.
7. Total Station: Introduction to total station and practicing setting up, levelling up and elimination of parallaxerror.
8. Total Station: Determination of area using totalstation.
9. Total Station:Traversing
10. Total Station:Contouring
11. Total Station: Determination of Remoteheight.
12. Total Station: distance between two inaccessiblepoints.

Note: Any 10 field work assignments must be completed**.**

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ALL OPEN ELECTIVES

		L	T	P	C
		3	0	0	3
a) DISASTER MANAGEMENT					

Course Learning Objectives:
The objective of this course is:

1. Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities.
2. Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phases of each are parallel and how they differ.
3. Understand the 'relief system' and the 'disaster victim.'
4. Describe the three planning strategies useful in mitigation.
5. Identify the regulatory controls used in hazard management.
6. Describe public awareness and economic incentive possibilities.
7. Understand the tools of post-disaster management.

Course Outcomes:
Upon the successful completion of this course, the students will be able to:

a. Affirm the usefulness of integrating management principles in disaster mitigation work
b. Distinguish between the different approaches needed to manage pre- during and post- disaster periods
c. Explain the process of risk management
d. Relate to risk transfer

SYLLABUS:

UNIT-I

Natural Hazards and Disaster Management: Introduction of DM – Inter disciplinary nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: Vegetal Cover floods, droughts – Earthquakes – landslides – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast.

UNIT-II

Man Made Disaster and Their Management Along With Case Study Methods Of The Following: Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrorism -threat in mega cities, rail and aircraft accidents, ground water, industries - Emerging infectious diseases and Aids and their management.

UNIT-III

Risk and Vulnerability: Building codes and land use planning – Social Vulnerability – Environmental vulnerability – Macro-economic management and sustainable development, Climate change risk rendition – Financial management of disaster – related losses.

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UNIT-IV

Role of Technology in Disaster Managements: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations- roads and bridges-mitigation programme for earth quakes – flowchart, geospatial information in agriculture drought assessment - Multimedia Technology in disaster risk management and training - Transformable Indigenous Knowledge in disaster reduction – Role of RS & GIS.

UNIT-V

Multi-sectional Issues, Education and Community Preparedness: Impact of disaster on poverty and deprivation - Climate change adaptation and human health - Exposure, health hazards and environmental risk-Forest management and disaster risk reduction -The Red cross and red crescent movement - Corporate sector and disaster risk reduction- Education in disaster risk reduction-Essentials of school disaster education - Community capacity and disaster resilience-Community based disaster recovery - Community based disaster management and social capital-Designing resilience- building community capacity for action.

TEXT BOOKS:

1. An Introduction of Disaster Management- Natural Disasters & Vulnerable Hazards– S.Vaidyanathan: CBS Punblishers & Distributors Pvt. Ltd.
2. Natural Hazards & Disaster Management, Vulnerability and Mitigation by RB Singh- Rawat Publications
3. 'Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
4. 'Disaster Management – Future Challenges and Opportunities' by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

REFERENCE BOOKS:

1. 'Disaster Management' edited by H K Gupta (2003), Universities press.
2. 'Disaster Management – Global Challenges and Local Solutions' by Rajib shah & R R Krishnamurthy (2009), Universities press.
3. R. Nishith , Singh AK, " Disaster Management in India : Perspectives, Issues and strategies" New Royal Book Company."

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		L	T	P	C
		3	0	0	3
b) ENVIRONMENTAL POLLUTION & CONTROL					

Course Learning Objectives:
The objective of this course is:

1. Impart knowledge on fundamental aspects of air pollution & control, noise pollution, and solid waste management.
2. Provide basic knowledge on sustainable development.
3. Introduces some basics of sanitation methods essential for protection of community health.
4. Provide basic knowledge on solid waste management.

Course Learning Outcomes:
By the end of successful completion of this course, the students will be able to:

a. Identify the air pollutant control devices
b. Have knowledge on the NAAQ standards and air emission standards
c. Differentiate the treatment techniques used for sewage and industrial wastewater treatment methods.
d. Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.
e. Appreciate the methods of environmental sanitation and the management of community facilities without spread of epidemics.
f. Appreciate the importance of sustainable development while planning a project or executing an activity.

SYLLABUS:

UNIT – I
Air Pollution: Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards.
Noise Pollution: Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000.

UNIT –II
Industrial Wastewater Management: – Strategies for pollution control - Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants - Recirculation of industrial wastes – Effluent standards.

UNIT – III
Solid Waste Management: Solid waste characteristics – basics of on-site handling and collection – separation and processing – Incineration-Composting-Solid waste disposal methods – fundamentals of Land filling.

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UNIT – IV

Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT- V

Sustainable Development: Definition- elements of sustainable developments -Indicators of sustainable development- Sustainability Strategies- Barriers to Sustainability–Industrialization and sustainable development – Cleaner production in achieving sustainability- sustainable development.

TEXT BOOKS:

1. Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elesevier, 2003.
3. Environmental Science
4.
5. and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
3. Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing.

REFERENCES:

1. Air Pollution and Control by M.N. Rao & H.N. Rao
2. Solid Waste Management by K. Sasi Kumar, S.A. Gopi Krishna. PHI New Delhi.
3. Environmental Engineering by Gerard Kiley, Tata McGraw Hill.
4. Industrial Water Pollution Control by Nemerow Jr., McGraw Hill Publishing.
5. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard – Cengage Learning.
6. Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.
7. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.

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		L	T	P	C
		3	0	0	3
c) ELEMENTS OF CIVIL ENGINEERING					

COURSE OBJECTIVES:

The objectives of this course are to make students to learn about
1. basics of Civil Engineering concepts
2. the surveying, elevations and mapping
3. the construction materials and elements
4. water resource development

COURSE OUTCOMES:

At the end of the course the student is familiar
a) basics of Civil Engineering concepts
b) the surveying the elevations and mapping
c) the construction materials and elements
d) water resource development and
e) overall infrastructure development

SYLLABUS

Unit I
Scope of Civil Engineering: Introduction: Impact of Infrastructural Development on the Economy of a Country, Role of Civil Engineers, Importance of Planning, Scheduling and Construction Management.
Surveying:
Introduction: Surveying and levelling, Object and uses, Primary divisions, Fundamental principles, Classification of surveying, Plans and maps, Scales, Units of measure.

Unit II:
Compass surveying:
Types and uses of compass, Bearings, Whole Circle Bearings, and Reduced Bearings, Computation of angles; Meridians; declinations and dip of needle; Local attraction; compass surveying field work.
Elevation measurements:
Levelling, object and uses, terms used in levelling, levelling instruments, methods of levelling, recording and methods of reducing, errors in levelling, contours; characteristics and applications.
Modern Tools of Surveying and Mapping:
Introduction to Theodolite, Electronic Distance Measurement Instruments, Total Station, Global Positioning System, Remote Sensing and Geographic Information System.

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Unit III:
Construction Materials
Requirement, types, uses, properties and importance of Civil Engineering materials like Stone, Bricks, Lime, Cement, Ferrous and Non Ferrous Metals, Ceramic Materials, Timber, Sand, Aggregate, Mortar and Concrete, Paints and Varnishes, Glass , Plastic, Conducting, Magnetic, and Miscellaneous Materials

Unit IV:
Elements of Building Construction
Planning:
Elementary principles and basic requirements of a building planning, layout of residential & industrial buildings.
Construction:
Classification of buildings based upon occupancy and structure, Design Loads, Common building components, their functions, and nominal dimensions. Elements of building drawing. Introduction to building byelaws.

Unit V
Water Resources Development
Elementary Hydrology, Sources of water, Watershed Development, water requirements and its conservation, Hydraulic Structures of Storage, Water Conveyance System: Canals; Water Conduits.

Books:

1. Surveying Vol. I & II, Dr. B. C. Punamia Laxmi Publication, Delhi
2. Building Construction, Dr. B. C. Punamia Laxmi Publication, Delhi
3. Engineering Material, Dr. S.C. Rangwal, Charotar Pub. House
4. Irrigation Engineering and Hydraulic Structures, Santoshkumar Garg, : Khanna Publishers Delhi
5. Civil Engineering Material, Jakson and Dhir, ELBS Publishing London
6. Civil Engg. Drawing, S. C. Rangwal, Charotar Pub. House Anand
7. Elements of Civil Engineering (IV Edition) by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3rd edition

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		L	T	P	C
		3	0	0	3
d) GREEN TECHNOLOGY					

Course Learning Objectives:

The objective of this course is:

1. To present different concepts of green technologies.
2. To acquire principles of Energy efficient technologies.
3. To impart knowledge on the methods of reducing CO_2 levels in atmosphere.
4. To gain knowledge of the importance of life cycle assessment
5. To learn the importance of green fuels and its impact on environment.

Course Learning Outcomes

Upon successful completion of this course, the students will be able to:

- Enlist different concepts of green technologies in a project
- Understand the principles of Energy efficient technologies
- Estimate the carbon credits of various activities
- Identify the importance of life cycle assessment
- Recognize the benefits of green fuels with respect to sustainable development.

SYLLABUS:

UNIT- I

Introduction: Green Technology – definition- Importance – Historical evolution – advantages and disadvantages of green technologies-factors affecting green technologies- Role of Industry, Government and Institutions – Industrial Ecology – role of industrial ecology in green technology.

Cleaner Production (CP): Definition – Importance – Historical evolution - Principles of Cleaner Production–Benefits–Promotion – Barriers – Role of Industry,

UNIT- II

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Cleaner Production Project Development and Implementation:

Government and Institutions – clean development mechanism, reuse, recovery, recycle, raw material substitution-Wealth from waste, case studies.

Overview of CP Assessment Steps and Skills, Process Flow Diagram, Material Balance, CP Option Generation – Technical and Environmental Feasibility analysis – Economic valuation of alternatives - Total Cost Analysis – CP Financing – Preparing a Program Plan – Measuring Progress- ISO 14000.

UNIT- III

Pollution Prevention and Cleaner Production Awareness Plan – Waste audit – Environmental Statement, carbon credit, carbon sequestration, carbon trading, Life Cycle Assessment - Elements of LCA – Life Cycle Costing – Eco Labelling.

UNIT -IV

Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Non-conventional energy sources: Solar Energy-solar energy conversion technologies and devices, their principles, working and application.

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UNIT- V

Green Fuels – Definition-benefits and challenges – comparison of green fuels with conventional fossil fuels with reference to environmental, economical and social impacts- public policies and market-driven initiatives.

Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in Indian context; tidal and geothermal energy.

TEXT BOOKS:

1. 'Pollution Prevention: Fundamentals and Practice' by Paul L Bishop (2000), McGraw Hill International.
2. 'Cleaner Production Audit' by Prasad Modak, C.Visvanathan and Mandar Parasnis (1995), Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok
3. 'Non-conventional Energy Sources' by Rai G.D.

REFERENCES:

1. 'Pollution Prevention and Abatement Handbook – Towards Cleaner Production' by World Bank Group (1998), World Bank and UNEP, Washington D.C.
2. 'Handbook of Organic Waste Conversion' by Bewik M.W.M.
3. 'Energy, The Solar Hydrogen Alternative' by Bokris J.O.
4. 'Solar Energy' by Sukhatme S.P.
5. 'Waste Energy Utilization Technology' by Kiang Y. H.

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		3	0	0	3
e) SMART CITIES					

Course Objectives:

The course aims towards

1. developing a sensitization
2. skills to understand
3. applicability of Inclusive urban planning and
4. improving towards the sustainable development.

Course Outcome:

After learning the course

The students should be able to:

a) Understand the importance
b) practicing the concept of inclusive urban planning
c) will have sensitization towards implementing contributions in sustainable development.

SYLLABUS

Unit – I **Understanding Inclusive Planning:**
Definition and components; urban consultations; basic principles of urban consultation, process of urban consultations; urban strategic planning, good urban governance, subsidiarity, equity, efficiency, transparency and accountability, civic engagement and citizenship, security; valuing difference and working with diversity; liveable cities;

Unit – II **Stakeholders profile and needs, access to shelter, services and livelihoods:**
Urban Poor, Informal Sector, Gender, Children, Elderly, Disabled, Displaced people, etc.; Slums - dimensions, causative factors, determinants, location characteristics of settlements; Informal sector - growth, characteristics, functions, economic contributions, linkages with formal sector, impact on Urban Development

Unit – III **Participatory Planning Process and Policies, Programmes and Legislation:**
Methods, role of stakeholders (including civil society organizations), etc.; Related Acts, Five year plans, policies and programmes at various levels.

Unit- IV **Smart Cities:**
Innovation economy (Innovation in industries, clusters, districts of a city; Knowledge workforce: Education and employment; Creation of knowledge-intensive companies); Urban Infrastructure (Transport, Energy/ Utilities, protection of the environment and safety); Governance (Administration services to citizens, participatory and direct democracy, services to the citizen, quality of life)

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Unit – V **Planning interventions:**
Inclusive zoning, development and building regulations, Slum Improvement; drafting strategic urban development plans – objectives and key actors; planning framework for actions, process of drafting the plan, key considerations; urban design and decision-making; city transport for all; water supply and sanitation, urban disaster management, management through decentralization,

Reference Books:

1. Jo Beall (1997); "A city for all: valuing differences and working with diversity"; Zed books limited, London
2. UN-Habitat; "Inclusive and sustainable urban planning: a guide for municipalities"; Volume 3: Urban Development Planning (2007); United Nations Human Settlements Programme
3. Arup Mitra; "Insights into inclusive growth, employment and wellbeing in India"; Springer (2013), New Delhi
4. William J. V. Neill (2004); "Urban Planning and cultural identity"; Routledge, London
5. John S. Pipkin, Mark E. La Gory, Judith R. Balu (Editors); "Remaking the city: Social science perspective on urban design"; State University of New York Press, Albany
6. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science
7. "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development (http://indiansmartcities.in/downloads/CONCEPT_NOTE_3.12.2014__REVISED_AND_LATEST_.pdf)

List of Open Source Software/learning website:

- Google books and publications on inclusive urban planning (https://www.google.co.in/search?q=inclusive+urban+planning&btnG=Search+Books&tbm=bks&tbo= 1&gws_rd=ssl)
- MoUD, GOI Website (http://indiansmartcities.in/site/index.aspx)

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		L	T	P	C
		3	0	0	3
f) PROJECT MANAGEMENT					

Course Learning Objectives:
The objective of this course is:

1. To introduce to the student, the concept of project management including network drawing and monitoring
2. to introduce the various equipment related to construction like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery
3. to introduce the importance of safety in construction projects

Course Outcomes:
Upon the successful completion of this course, the students will be able to:

a) appreciate the importance of construction planning
b) understand the functioning of various earth moving equipment
c) know the methods of production of aggregate products and concreting
d) apply the gained knowledge to project management and construction techniques

SYLLABUS:

UNIT- I
Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical path method

UNIT -II
Project evaluation and review technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources introduction to softwares for construction management project management using PRIMAVERA (or) equivalent.

UNIT- III
Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers

UNIT -IV
Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell buckets
Concreting equipment — concrete mixers – Batching plants, mobile using plants like “Ajax” etc. mixing and placing of concrete – consolidating and finishing

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UNIT -V

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering
BIM for Civil Engineers (Building Information Modelling)

TEXT BOOKS:

1. 'Construction Planning, Equipment and Methods' by Peurifoy and Schexnayder , Shapira, Tata Mcgrawhill
2. 'Construction Project Management Theory and Practice' by Kumar Neeraj Jha (2011), Pearson.
3. 'Construction Technology' by Subir K. Sarkar and Subhajit Saraswati, Oxford University press

REFERENCES:

1. 'Construction Project Management - An Integrated Approach' by Peter Fewings , Taylor and Francis
2. 'Construction Management Emerging Trends and Technologies' by Trefor Williams , Cengage learning

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g) TRAFFIC SAFETY					

Course Objectives:

1) This module on the fundamentals of traffic engg. & some of the statistical methods to analyse the traffic safety.
2) The accident interrogations and risk involved with measures to identify the causes are dealt.
3) The role of road safety in planning the urban infrastructures design is discussed.
4) Various mitigation measures to prevent the road accidents are dealt.

Course Outcomes: The student is able to

a) To understand fundamentals of Traffic Engg.
b) To investigate and determine the collective factors & remedies of accident involved.
c) To design and plan various road geometrics.
d) To manage the traffic system from road safety point of view.

UNIT I

Fundamentals of Traffic Engineering:

Basic Characteristics of Motor-Vehicle Traffic, Highway Capacity, Applications of Traffic Control Devices, Traffic Design of Parking Facilities, Traffic Engineering Studies; Statistical Methods in Traffic Safety Analysis – Regression Methods, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons.

UNIT II

Accident Investigations and Risk Management:

Collection and Analysis of Accident Data, Condition and Collision Diagram, Causes and Remedies, Traffic Management Measures and Their Influence on Accident Prevention, Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements, Determine Possible Causes of Crashes, Crash Reduction Capabilities and Countermeasures, Effectiveness of Safety Design Features, Accident Reconstruction.

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UNIT III

Road Safety in Planning and Geometric Design:

Vehicle And Human Characteristics, Road Design and Road Equipments, Redesigning Junctions, Cross Section Improvements, Reconstruction and Rehabilitation of Roads, Road Maintenance, Traffic Control, Vehicle Design and Protective Devices, Post Accident Care.

UNIT IV

Role of Urban infrastructure design in safety:

Geometric Design of Roads; Design of Horizontal and Vertical Elements, Junctions, At Grade and Grade Separated Intersections, Road Safety in Urban Transport, Sustainable Modes and their safety.

UNIT V

Mitigation Measures:

Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety; Safety in urban areas; Public transport and safety; Road safety policy making, Stakeholders involvement; Road safety law, Road safety audit.

TEXT BOOKS:

1. Institute of Transportation Engineers (ITE), The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 1999.
   Towards Safe Roads in Developing country, TRL – ODA, 2004.
2. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
3. Fundamentals of Traffic Engineering, Richardo G Sigua

REFERENCES:

1. Athelstan Popkess, Traffic Control and Road Accident Prevention, Chapman and Hall, 1997 (Digitized 2008)
2. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, TrulsVaa, Michael Sorenson
3. Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 1997 (reprinted 2002).
4. Geetam Tiwari and Dinesh Mohan, Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, CRC Press, 2016
5. Fundamentals of Transportation Engineering – C.S. Papacostas, Prentice Hall India.
6. Transportation Engineering – An Introduction, C.Jotinkhisty, B. Kent Lall
7. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, Truls Vaa, Michael Sorenson

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8. Road Safety by NCHRP.

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h) GEO-SPATIAL TECHNOLOGIES					

Course Objectives:

1. Understand the various spatial and non-spatial data types, and data base management
    a. techniques
2. Develop the concepts and professional skills in utility of geospatial techniques
3. Improve the working knowledge of geospatial techniques in field problems

Course Outcomes:

At the end of the course the student will be able to:

a) Understand the geospatial technology relating to the data acquiring and processing that is associated with geographic locations
b) Apply Geospatial techniques in the decision support systems useful for decision makers and community services.
c) Ability to solve the problems related to the natural resource management, environment, urban planning and Infrastructure development, etc.
d) Able to generate the thematic maps using Geospatial techniques
e) Apply the concept of Geospatial Techniques to the Civil Engineering problems

SYLLABUS

UNIT –I

Introduction – Basic concepts, socioeconomic challenges, fundamentals of geographical information systems (GIS), history of geographical information system, components of geographical information systems.

Projections and Coordinate Systems – Map definitions, representations of point, line, polygon, common coordinate system, geographic coordinate system, map projections, transformations, map analysis.

UNIT –II

Data Acquisition:Data Types, Spatial, Non-Spatial (Attribute) Data, Data Format – Vector and Raster Data, Manual Digitizing, Scanner, Aerial Photographic Data, Remotely Sensed Data, Digital Data, Cartographic Database, Digital Elevation Data.

Data Management:Data Storage and Maintenance, Data Compression, Data Quality and Standards, Precision, Accuracy, Error – Geometric errors and corrections, Radiometric errors and corrections, types of Systematic and Non-systematic errors.

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UNIT –III

Data Modeling: Spatial Data Analysis, Data Retrieval Query, Simple Analysis, Recode Overlay, Vector Data Model, Raster Data Model, Digital Elevation Model, Cost and Path Analysis, Knowledge Based System.

GIS Analysis and Functions: Organizing data for analysis, analysis function, maintenance and analysis of spatial data, buffer analysis, overlay analysis, transformations, conflation, edge matching and editing, maintenance and analysis of spatial and non-spatial data.

UNIT –IV

Applications of GIS: Environmental and Natural Resource Management, Soil and Water Resources, Agriculture, Land Use Planning, Geology and Municipal Applications, Urban Planning and Project Management, GIS for decision making under Uncertainty, standard GIS packages, Introduction to Global Positioning Systems (GPS) and its applications.

UNIT – V

Introduction to Remote Sensing: General background of Remote Sensing Technology, Objectives and Limitations of Remote Sensing, Electro-Magnetic Radiation, Characteristics, Interaction with Atmosphere and Earth Surface, Remote Sensing Platforms and Sensors, Satellite Characteristics, Digital Image Processing, IRS Series and High Resolution Satellites, Remote Sensing Applications to Watershed Modeling, Environmental Modeling, Urban Planning and Management.

Textbook:

1. Demers, M.N, (2013). *'Fundamentals of Geographic Information Systems'* Wiley India Pvt. Ltd,.
2. Burrough, P. A., and McDonnell R. A. (1998). *Principles of Geographical Information Systems.* Oxford University Press, New York.
3. Kang-tsung Chang. (2006). *Introduction to Geographical Information Systems.* Tata McGraw-Hill Publishing Company Ltd., Third Edition, New Delhi.
4. George Joseph, (2013). *'Fundamentals of Remote Sensing'* Universities Press.

References:

1. Sabins F.F. Jr. (1978). *Remote Sensing Principles and Interpretations.* W.H. Freeman and Company, San Francisco.
2. Tor Bernhardsen. (2002). *Geographical Information System.* Wiley India (P) Ltd., Third Edition, New Delhi.
3. Hoffman-Wellenhof, B, et al. (1997). *GPS Theory and Practice.* Fourth Edition, Springer Wein, New York.
4. Lilysand T.M., and Kiefer R.W. (2002). *Remote Sensing and Image Interpretation*. John Wiley and Sons, Fourth Edition, New York.
5. Choudhury S., Chakrabarti, D., and Choudhury S. (2009). *An Introduction to Geographic Information Technology*. I.K. International Publishing House (P) Ltd, New Delhi.

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i) WASTEWATER TREATMENT					

Course Learning Objectives:
The course will address the following:

1. Enables the student to distinguish between the quality of domestic and industrial water requirements and wastewater quantity generation.
2. To impart knowledge on selection of treatment methods for industrial wastewater.
3. To know the common methods of treatment in different industries
4. To acquire knowledge on operational problems of effluent treatment plant.

Course Outcomes:
Upon the successful completion of this course, the students will be able to:

a) Know the quality and quantity of water for various industries and Advanced water treatment methods
b) Learn the common methods of treatment of wastewaters and Biological treatment methods
c) Study of methods to reduce impacts of disposal of wasters into environment and CETPs.
d) Study of methods of treatment of wastewaters from specific industries like steel plants, refineries, and power plants, that imply biological treatment methods
e) Study of methods of treatment of wastewaters from industries like Aqua, dairy, sugar plants, and distilleries that imply biological treatment methods

SYLLABUS:

UNIT – I
Industrial water Quantity and Quality requirements: Boiler, Cooling, Domestic/Canteen and Process waters for Textiles, Food processing, Dairy, Aqua industry, Sugar mills, Brewery and distillery Industries, Fertilizer industry, Power plants. Advanced water treatment - Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, Freezing, elutriation, Removal of Iron and Manganese, Removal of Colour and Odour. Use of Municipal wastewater in Industries.

UNIT – II
Basic theories of Industrial Wastewater Management: Industrial waste survey - Measurement of industrial wastewater Flow-generation rates – Industrial wastewater sampling and preservation of samples for analysis - Wastewater characterization- Toxicity of industrial effluents- Common methods of Treatment of wastewaters - Unit operations and processes- Volume and Strength reduction –Neutralization – Equalization and proportioning- recycling, reuse and resources recovery. Miscellaneous Treatment: Biological treatment of sewage- Primary, secondary and Tertiary treatment of sewage.

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UNIT – III

Industrial wastewater disposal management: Discharges into Sewers, Streams- Oxygen sag curve, Lakes-eutrophication and oceans and associated problems, Land treatment – sewage sickness, Common Effluent Treatment Plants: advantages and suitability, Limitations and challenges- Recirculation of Industrial Wastewaters- Effluent Disposal Method.

UNIT – IV

Process and Treatment of specific Industries-1: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Steel plants, Fertilizers, Textiles, Paper and Pulp industries, Oil Refineries, Coal and Gas based Power Plants. Case studies.

UNIT – V

Process and Treatment of specific Industries-2: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Tanneries, Sugar Mills, Distillers, Dairy and Food Processing industries, Aqua industry, Pharmaceutical Plants. Case studies.

Text books

1. Industrial Wastewater Treatment by KVSG Murali Krishna, Paramount Publishers, Visakhapatnam, 2019
2. Wastewater Treatment by M.N. Rao and A.K. Dutta, Oxford & IBH, NewDelhi.
3. Industrial Wastewater treatment by A.D. Patwardhan, PHI Learning,Delhi
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, Shyam R Asolekar, Mc-Graw Hill, New Delhi; 3rd Edition

References

1. Industrial Water Pollution Control by W. Wesley Eckenfelder, Mc- GrawHill, Third Edition
2. Wastewater Engineering by Metcalf and EddyInc.,Tata McGrawhillCo., New Delhi
3. Wastewater Treatment- Concepts and Design Approach by G.L. Karia & R.A. Christian, Prentice Hall of India.
4. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard, Cengage Learning.