

**ABHILASHI UNIVERSITY  
CHAILCHOWK, MANDI (H.P.)**

**SYLLABUS  
M.TECH  
CIVIL ENGINEERING**



**TEACHING AND EXAMINATION SCHEME**

# M.TECH. CIVIL ENGINEERING

## COURSE STRUCTURE

### FIRST SEMESTER

Sr. No	Course Code	Course Title	Contact Hours				Credits	Examination		
			L	T	P	Total		IA	ESE	Total
1	AUMTCE/ME-101	Agricultural Engineering	3	2	0	5	4	40	60	100
2	AUMTCE/ME/CSE-102	Research Methodology	3	2	0	5	4	40	60	100
3	AUMTCE-103	Advanced Concrete Technology	3	2	0	5	4	40	60	100
4	AUMTCE-104*	Elective -I	3	2	0	5	4	40	60	100
5	AUMTCE-105	Concrete Technology Lab	0	0	8	8	4	40	60	100
		<b>Total</b>	<b>12</b>	<b>8</b>	<b>8</b>	<b>28</b>	<b>20</b>	<b>200</b>	<b>300</b>	<b>500</b>
<b>ELECTIVE-I</b>										
1	AUMTCE-104(A)	Composite Materials	3	2	0	5	4	40	60	100
2	AUMTCE-104(B)	Construction planning & Management	3	2	0	5	4	40	60	100

### SECOND SEMESTER

Sr. No	Course Code	Course Title	Contact Hours				Credits	Examination		
			L	T	P	Total		IA	ESE	Total
1	AUMTCE-201	Solid Waste Management	3	2	0	5	4	40	60	100
2	AUMTCE-202	Environmental Health & Hygiene	3	2	0	5	4	40	60	100
3	AUMTCE-203	Advanced RCC Design	3	2	0	5	4	40	60	100
4	AUMTCE-204*	Elective-II	3	2	0	5	4	40	60	100
5	AUMTCE-205	Environmental Engineering Lab	0	0	8	8	4	40	60	100
		<b>Total</b>	<b>12</b>	<b>8</b>	<b>8</b>	<b>28</b>	<b>20</b>	<b>200</b>	<b>300</b>	<b>500</b>
<b>ELECTIVE-II</b>										
1	AUMTCE-204(A)	Advanced Structural Analysis	3	2	0	5	4	40	60	100
2	AUMTCE-204(B)	Advanced Hydrology	3	2	0	5	4	40	60	100

# M.TECH. CIVIL ENGINEERING

## COURSE STRUCTURE

## SPECIALISATION

## THIRD SEMESTER

### TRANSPORTATION ENGINEERING

Sr. No	Course Code	Course Title	Contact Hours				Credits	Examination		
			L	T	P	Total		IA	ESE	Total
1	AUMTCE-301(T)	Public Transportation Planning	3	2	0	5	4	40	60	100
2	AUMTCE-302(T)	Remote Sensing & GIS	3	2	0	5	4	40	60	100
3	AUMTCE-303(T)	Railway Infrastructure Planning & Design	3	2	0	5	4	40	60	100
4	AUMTCE-304(T)	Highway Pavement Design	3	2	0	5	4	40	60	100
5	AUMTCE-305(T)	Pre Thesis	0	0	0	0	20	80	120	200
		Total	12	8	0	20	36	240	360	600

### ENVIRONMENTAL ENGINEERING

Sr. No	Course Code	Course Title	Contact Hours				Credits	Examination		
			L	T	P	Total		IA	ESE	Total
1	AUMTCE-301(E)	Renewable Energy	3	2	0	5	4	40	60	100
2	AUMTCE-302(E)	Remote Sensing & GIS	3	2	0	5	4	40	60	100
3	AUMTCE-303(E)	Water Resources Planning and Management	3	2	0	5	4	40	60	100
4	AUMTCE-304(E)	Environmental Impact Assessment	3	2	0	5	4	40	60	100
5	AUMTCE-305(E)	Pre Thesis	0	0	0	0	20	80	120	200
		Total	12	8	0	20	36	240	360	600

### CONSTRUCTION TECHNOLOGY ENGINEERING

Sr. No	Course Code	Course Title	Contact Hours				Credits	Examination		
			L	T	P	Total		IA	ESE	Total
1	AUMTCE-301(C)	Bridge Engineering	3	2	0	5	4	40	60	100
2	AUMTCE-302(C)	Remote Sensing & GIS	3	2	0	5	4	40	60	100
3	AUMTCE-303(C)	Design of Pre-Stressed Concrete Structures	3	2	0	5	4	40	60	100
4	AUMTCE-304(C)	Concrete Technology	3	2	0	5	4	40	60	100
5	AUMTCE-305(C)	Pre Thesis	0	0	0	0	20	80	120	200
		Total	12	8	0	20	36	240	360	600

## FOURTH SEMESTER

Sr. No	Course Code	Course Title	Contact Hours				Credits	Examination		
			L	T	P	Total		IA	ESE	Total
1	AUMTCE-401	Thesis /Dissertation	--	---	---	---	20	80	120	200
		Total	0	0	0	0	20	80	120	200
TOTAL MARKS IN ALL SEMESTERS			TOTAL CREDITS IN ALL SEMESTERS							
1800			96							

**Note: Following criteria of evaluation sheet of thesis.**

- Requirement for the award of M-Tech. degree in Civil Engineering is 96 credits in theory/ practical papers with minimum CGPA of 5.0 and successful completion of thesis work.
- Thesis work will also be "Accepted" or "Rejected". If accepted, the Quality of work reported in thesis can be graded as in table below

**Instruction for paper setter:**

The Question Paper will consist of five sections, A, B, C, D & E. Section E will be compulsory & consist of single question with 10-20 subparts of short answer type, which will cover the entire syllabus. Section A, B, C, & D will have two questions from the respective sections of the syllabus. Each section will have weight-age of 20% of the total marks of the end semester examination for the course.

# **FIRST SEMESTER**

## **Agricultural Engineering**

**AUMTCE-101**

### **OBJECTIVES:**

- Provide an insight on Agricultural Engineering, management and its components,

### **OUTCOME:**

- Able to Understand the principles of Agricultural Engineering and apply them in the fields to enhance the production

### **SECTION A**

Introduction to Agricultural Engineering, Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Principles of erosion control: Introduction to contouring, strip cropping. Contour bund.

### **SECTION B**

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with solar energy gadgets: solar photovoltaic system and their application, introduction of wind energy and their application.

### **SECTION C**

Green house technology: Introduction and Types. Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Design criteria of green house for cooling and heating purposes.

### **SECTION D**

Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management. Types of benches and contours. Irrigation and Fertigation management.

### **TEXT BOOKS:**

- Elements of Agricultural Engineering, Jagdishwar Sahay
- Introduction to agriculture engineering, Harry L Field

**OBJECTIVES:**

- The method is supported by powerful optimization and numerical techniques, which allow us to work with bodies of complex initial design and with very fine finite-element meshes, giving thus quite accurate solutions even in "difficult" parts and for complex geometries.

**OUTCOME:**

- Able to apply the knowledge of sampling data & conducting various analysis

**SECTION A****Overview of Research:**

Research and its type, identifying and defining research problems, introduction to different types of research designs. Essential constituents of literature review. Basic principles of experimental design, completely randomized, randomized block & Latin square

**SECTION B****Methods of Data Collection:**

Primary and secondary data, methods of primary data collection, classification of secondary data

**SECTION C****Sampling Methods:**

Probability sampling: simple random sample, systematic sampling, stratified sampling, cluster sampling and multistage sampling; Non-probability sampling: convenience sampling, judgement sampling, quota sampling; sampling distribution

**SECTION D****Processing and Data Analysis:**

Statistical measures and their significance: central tendencies, measures of variability, skewness, kurtosis, correlation and regression; hypothesis testing: parametric test (z, t, F), Chi square, ANOVA and non-parametric test

**Reliability and Validity:**

Test- retest reliability, alternative form reliability, internal-comparison reliability, and scorer reliability; content validity, criterion- related validity and construct validity

**TEXT BOOKS:**

- Geoffrey R. Norman, David L. Streiner, Biostatistics: The Bare Essentials, PMPH USA
- Beth Dawson, Robert G. Trapp, Basic & Clinical Biostatistics, McGraw-Hill
- Marcello Pagano, Kimberlee Gauvreau, Principles of Biostatistics, CRC Press

**REFERENCE BOOKS:**

- Antonella Bacchieri, Giovanni Della Cioppa, Fundamentals of Clinical Research, Springer

**OBJECTIVES:**

- Understand the principles of concrete technology and apply them during construction supervision and testing.
- Supervise and manage concrete manufacturing and construction.

**OUTCOME:**

- Information on various ingredients, their physical and chemical properties including properties of green and hardened concrete.
- Mix design procedures as per BIS, ACI and British mix methods, including design of concrete using fibers and mineral architecture.

**SECTION A****Principles of concrete mix design procedures:**

Concrete materials; mix proportioning and early age properties, strength, permeability and durability. BIS/ACI/ British standards, mix design procedures using fly ash, fibers and design of high performance concrete.

**SECTION B****Concreting operations:**

Practices and equipment, batching, mixing, transportation, shuttering and staging, placing and compacting, curing, accelerated curing, finishing and jointing.

**SECTION C****Properties and techniques of construction for conventional and special concretes:**

Admixtures, polymers, epoxy resins, pozzolanic materials and fly ash, fiber reinforced concrete, light weight concrete, heavy weight concrete, foam concrete, high performance concrete.

Operations, shotcrete, grouting, guniting, under water concreting, ready mix concrete.

**SECTION D****Construction techniques for reinforced concrete:**

Elements- materials, principles and procedures for beams, slabs, columns, foundations, water tanks, design and fabrication of form works for RCC elements, features of slip forming and precaution, details of special shuttering required for lining of tunnel, procedures and precautions.

**Pre- stressed concrete construction:**

Principle, methods, materials, tools and equipments for construction of pre stressed concrete structures.

**TEXT BOOKS:**

- Gambhir, M.L. (2004). Concrete Technology. New Delhi, Tata McGraw Hill.
- Orchard. (1979). Concrete Technology. London, Applied Science Publishers Ltd.
- Neville, Brooks. (2006). Concrete Technology. England, Addison – Wesley.

**OBJECTIVES:**

- Understand the principles of Composite Materials and apply them during construction supervision and testing.
- Supervise and manage concrete manufacturing and construction.
- Interpret the test results in accordance with BIS Stipulations.

**OUTCOME:**

- Able to Plan the quality checks and bring about economy in concrete construction.

**SECTION A****Supplementary Cementing Materials:**

Types of supplementary cementing materials such as fly ash, silica fume, rice husk ash, and metakaolin; their physical, chemical, mineralogical properties; Effects of these materials on the fresh properties; Strength properties; Durability properties.

**SECTION B****Fibre Reinforced Concrete:**

Definition; types of fibres; Properties of fibres; Factors affecting FRC. Mixing and casting procedure; Composite materials approach; Effect of fibres on the workability, strength and durability of concretes; Applications of different types of fibres.

**SECTION C****High Volume Fly Ash Concrete:**

Definition, Effect of types of fly ash in large quantities on the strength properties of concrete; Durability and abrasion resistance of HVFA; Applications of HVFA.

Self-Compacting Concrete (SCC): Definition, Advantages and disadvantages of SCC; Various mix design procedures; Tests for SCC; Applications for SCC.

**SECTION D****High Performance Concrete:**

Definition of HPC; Material selection and its properties; Parameters for concrete being considered as HPC; Applications of HPC. Polymer Concrete Composites: Definition; Types of monomers and polymers; Types of polymer concretes and their applications.

**Fibre Reinforced Plastics (FRP):**

Types of FRP, their properties and effects on concrete elements under various loading conditions. Use of Waste Materials and By-products: Types of waste materials and by-products such as waste glass, scrap tires, waste foundry sand, clean coal ash, etc.

**TEXT BOOKS:**

- Nevelli, A. M., Properties of Concrete, Prentice Hall of India (1995).
- Siddique, R., Special Structural Concretes, Galgotia Publications (2000).
- Krishna Raju, N., Concrete Mix Design, CBS Publications (2002).



**OBJECTIVES:**

- Provide an insight on Construction planning, scheduling, its components and its characteristics
- Explain sampling of data, analysis and interpretation of data in conducting various survey

**OUTCOME:**

- Able to acquire and apply knowledge of Construction planning, scheduling, its components and its characteristics
- Able to apply the knowledge of sampling data in conducting various surveys and analysis

**SECTION-A**

**Construction Planning:** Objectives and functions, stages in construction, work breakdown structure, pre-tender stage planning, contract stage planning, methods of scheduling, bar charts, limitations of bar charts, milestone charts, preparation of material, equipment, labour, and finance schedule.

**SECTION-B**

**Critical Path Method (CPM):** Network techniques, element of a network, rules for developing networks, development logics, numbering events, time computations, activity floats, network updating. Resources profile, resources smoothing and resources leveling. Cost versus time, direct cost, indirect cost, total project cost, optimum duration, contracting network for cost optimization.

**SECTION-C**

**Programme Evaluation and Review Technique (PERT):** Probability concept in network, optimistic time, pessimistic time, most likely time, variance, standard deviation, slack, central limit theorem. probability of achieving completion time.

**SECTION-D**

**Precedence Diagram Method (PDM):** Precedence networks fundamentals, advantages, logic and precedence networks applications, PDM versus CPM.

**Line of Balancing (LOB) technique in the construction scheduling:** Line of balance methods of scheduling repetitive construction.

**Text Books:**

- Chitkara, K.K. "Construction Project Management, Planning scheduling and controlling."
- Moder J.J. Philips, C.R. and Davis, E.W. "Project Management with CPM and PERT, and precedence diagramming"

1. Testing of cement: Consistency, fineness, setting time, Specific Gravity, Soundness and strength.
2. Testing of fine aggregate: Specific Gravity, sieve analysis and zoning, bulking of fine aggregate, bulk density, silt content.
3. Testing of coarse aggregate: Specific Gravity, sieve analysis, bulk density, flakiness index, elongation index, water absorption & moisture content, soundness of aggregate.
4. Concrete Mix design by ACI 211.1-91 method, IS code method as per 10262-2007 & 456-2000, DOE method
5. Tests on Concrete- Workability tests – Slump cone test, compaction factor test, Vee-bee consistometer test, flow table test, strength tests- compressive strength, flexural strength, split tensile strength.
6. Effects of Admixture - Accelerator, Retarder, Super Plasticizer.
7. Nondestructive Testing - Rebound Hammer test, Ultrasonic Pulse Velocity test.

### **Solid Waste Management**

**AUMTCE-201**

#### **OBJECTIVES:**

- Provide an insight on Solid waste, its components and its characteristics
- Explain sampling , transportation, treatment and disposal of waste

#### **OUTCOME:**

- Able to acquire and apply knowledge of solid waste, its management , its components and its characteristics

#### **Section-A**

**Solid Wastes:** Characteristics: Physical Chemical and Biological.

**Solid Waste Services and Collection System:** Street sweeping, Types of solid waste services, door to door or street collection, backyard collectio , Stationary and hauled collection system, Route analysis.

#### **Section-B**

**Solid waste storage and Volume reduction:** Storage at point of generation collection, Shredding and cutting, compressing and boiling.

**Solid Waste Management:** Problems and impacts of solid waste in developing countries, Solid waste management and organization sources, Quantity and Composition of Municipal solid waste, Functional Elements of Municipal Solid Waste Management.

#### **Section – C**

**Transfer and Transport:** Optimization of roots, tools and equipment, Solid Waste transfer stations, location, types and layouts, Transfer and Transportation Vehicles and routes.

**Solid waste treatment system:** Physical, Chemical and Biological-rasping, Air and Magnetic separation, Incineration: Types, features and different types of incinerator, Mechanism of Incineration, Operation, Selection, Economics and Application.

#### **Section- D**

**Composting:** Process microbiology, Aerobic and Anaerobic composting, Composting Plants, Biological digestion.

**Sanitary Landfill:** Process, Mechanism, classification, types, site considerations, Maintenance of site, Future processing method, Pyrolysis , Refuse derived fuel.

#### **Text Books:**

- Techbanoglous G. Theissen H. and Elissen R. "Solid Waste Engineering- Principles and Management Issues" McGraw Hill New York.
- Solid waste by Techbanoglous, Theisen, Eliassen- McGraw Hill.
- Management of Solid Wastes in Developing Countries by Flintoff- WHO.

**OBJECTIVES:**

- Gain knowledge concerning environmental health, various pollutants, disease parameters etc.

**OUTCOME:**

- Familiarization with various problems related to environmental health

**Section –A**

**Dimensions of environmental health:** causative agents of diseases, Social factors, urban problems, housing and health, economy and health, climate and other atmospheric elements, violence, crime and other atmospheric elements, Violence, crime and mental health, family health practice, health care planning and delivery, chronic and communicable disease, worldwide nutrition and population control.

**Section-B**

**Pollutants:** - Industrial and agricultural pollutants, occupational health, epidemiological data, occupational health hazards, environmental. Exposure and diseases, Industrial toxicants, hazardous waste, preventing exposure to unhealthy and unsafe working conditions, vector control.

**Section-C**

**Disease Parameters:** Disease control, disease prevention, morbidity and mortality, disease and progressive deterioration, controlling diseases and disability Foodborne and waterborne disease outbreaks, Controlling stress of life, epidemiology.

**Section –D**

**Nuclear energy and environmental health:** Concerns and uncertainties about nuclear power, Nuclear power plants, Safety.

**Environmental health Planning:** Need for planning, the planning process. Environmental health services, various agencies, International efforts, role of industry, voluntary health agencies, Law and human welfare, Constitutional right to healthy environment, environmental education.

**Text Books:**

- Willgoose- Environmental Health.
- Morgan - Environmental Health.
- Cairncross and Feachem – Environmental Health Engineering in Topics.
- The world Bank –Appropriate technology for water supply and sanitation.
- Rangwala K.S. &Rangwala P.S. (2015) Bridge Engg, Anand. Charotar Publishing House (P) Ltd.

**OBJECTIVES:**

- Provide an insight on RCC Design, its planning, its components and its characteristics
- Explain sampling of data, analysis and interpretation of data in conducting various survey

**OUTCOME:**

- Able to design and analyze various types of problems related to concrete designs.

**SECTION-A****Introduction:**

Estimation of crack width and deflection of reinforced concrete beams & Analysis and design of building frames subjected to wind load.

**SECTION-B****Earthquake resistance design:**

Earthquake forces and structural response, Theory of Vibrations, Indian Seismicity, Earthquake History, Behavior of structures in the past Earthquakes.

**SECTION-C**

**Design of Water Tank:** Classification of water tank, method of analysis, permissible stresses, codal provisions. Design of circular and rectangular under-ground water tanks using IS code method.

**SECTION-D**

**Design of Footings:** Types of footings, safe bearing capacity of soil, depth of foundation, Indian standard code (IS: 456-2000) recommendations for footings – minimum cover, thickness at the edge of footing, bending moment, shear force, punching shear, tensile reinforcement, etc.

**TEXT BOOKS:**

- R. Park and T. Pauley, Reinforced concrete structures, John Wiley and sons
- A. K. Jain, Reinforced Concrete: Limit State design, Nem Chand and Bros. 1999.
- H. Nilson, D. Darwin and C. W. Dolar, Design of Concrete structures, Tata McGraw Hill

**OBJECTIVES:**

- The main objective is to enable the student to have a good grasp of all the fundamental issues in these advanced topics in Advanced Structural Analysis
- Explain sampling of data, analysis and interpretation of data in conducting various survey

**OUTCOME:**

- Able to acquire and apply knowledge of Advanced Structural analysis, its components and its characteristics

**SECTION-A**

**Engineering Mechanics:** System of forces, free-body diagrams, equilibrium equations; Internal forces in structures; Friction and its applications; Kinematics of point mass and rigid body; Centre of mass; Euler's equations of motion; Impulse-momentum; Energy methods; Principles of virtual work.

**SECTION-B**

**Structural Analysis:** Statically determinate and indeterminate structures by force/ energy methods; Method of superposition; Analysis of trusses, arches, beams, cables and frames;

**Displacement methods:** Slope deflection and moment distribution methods; Influence lines; Stiffness and flexibility methods of structural analysis

**SECTION-C**

**Construction Materials and Management:** Construction Materials: Structural steel - composition, material properties and behavior; Concrete - constituents, mix design, short-term and long-term properties; Bricks and mortar; Timber; Bitumen.

**Construction Management:** Types of construction projects; Tendering and construction contracts; Rate analysis and standard specifications; Cost estimation; Project planning and network analysis - PERT and CPM.

**SECTION-D**

**Concrete Structures:** Working stress, Limit state and Ultimate load design concepts; Design of beams, slabs, columns; Bond and development length; Pre-stressed concrete; Analysis of beam sections at transfer and service loads.

**Text Books:**

- Gere, G. M. and Weaver, Jr. W., Matrix Analysis of Framed Structures, CBS Publishers (1987).
- McCormac, J. C. & Nelson, J. K., Structural Analysis: A Classical and Matrix Approach, Iyengar, N.G.R., Elastic Stability of Structural Elements, Macmillan India Ltd (1980).
- Pandit & Gupta, Matrix Analysis of Structures, Tata McGraw Hill Publications (2003)

**OBJECTIVES:**

- To introduce the fundamentals of hydrological models used in solving the water resources problems.
- To understand practical flow aspects of fluid flow in various hydraulic structures such as open channel, canal falls, hydraulic jump, dams and spillway etc.

**OUTCOME:**

- Able to analyze the rain fall data with the help of hydrological models and to estimate the design flood.
- Able to apply the model results in verifying the analysis and design of structures.

**SECTION-A****Introduction:**

Precipitation, Isohytal method, Area depth duration and intensity duration frequency curves, Design applications, Standard Project Storm

**SECTION-B****Water Losses:**

Measurement and estimation of evaporation and transpiration

**SECTION-C****Design:**

Runoff, Rainfall runoff relationship Hydrograph, Design Flood, Unit Hydrograph, Instantaneous Unit Hydrograph

**SECTION-D****Flood Dynamics:**

Flood Routing, Flood Forecasting, Hydrologic Models.

**Text Books:**

- Applied Hydrology; K.N. Mutreja, Tata – Mc-Graw Hill. (1990)
- Hydrology for Engineers, Linsley, Kohler, Mc-Graw Hill. (1949)
- Handbook of Applied Hydrology, V.T.Chaw (1988)

1. Sampling: Study of the characteristics (turbidity , electrical conductivity ) of the different samples of water & waste water.
2. Chemical analysis of water :- Determination of ions ( hardness) by volumetric, gravimetric & colorimetric methods
3. Study of DO, BOD& COD using conventional Laboratory Methods.
4. Analysis of soil for chloride, sulphate, pH & conductivity.
5. Preparation of Reports of performance evaluation of waste water treatment plants of adjoining cities and towns.



**THIRD SEMESTER**  
**TRANSPORTATION ENGINEERING**

**Public Transport Planning**

**AUMTCE-301(T)**

**OBJECTIVES:**

- Provide an insight on Public transport, its planning, its components and its characteristics
- Explain sampling of data, analysis and interpretation of data in conducting various survey

**OUTCOME:**

- Able to acquire and apply knowledge of Public transport, its planning, its components and its characteristics
- Able to apply the knowledge of sampling data in conducting various surveys and analysis

**SECTION-A**

**Development of Public Transit System:** Historical Growth, Modes of public transport and comparison, public transport travel characteristics, technology of bus, rail, rapid transit systems and basic operating elements.

**SECTION-B**

**Transit Network Planning:** Objectives, principles, Intercity and Regional transit system, considerations, transit lines – types, geometry and characteristics, transit routes and their characteristics, timed transfer networks, prediction of transit usage, network evaluation and accessibility considerations.

**SECTION-C**

**Transit Scheduling:** Components, determination of service requirements, scheduling procedure, marginal ridership, crew scheduling.

**SECTION-D**

**Transit Infrastructure Facilities:** Design of bus stops, design of terminals – principles of good layout, types of layout, depot location, twin depot concept, crew facilities and amenities.

**Transit Agency and Economics:** Organizational structure of transit agency, management and personnel, transit system statistics, performance and economic measures, operations, fare structure.

**Text Books:**

1. Vukan R. Vuchic, “Urban Transit : Operations, Planning and Economics”, Wiley Sons Publishers.
2. Peter White, “Public Transport”, UCL Press
3. Kadiyali L.R., “Traffic Engineering and Transport Planning”, Khanna Publishers
4. Khisty, C J., “Transportation Engineering – An Introduction”, Prentice-Hall, NJ
5. TCRP Report 30, TCRP Report 95, TCRP Report 100

### **OBJECTIVES:**

- Provide an insight on GIS, its planning, its applications, its components and its characteristics
- Explain sampling of data, analysis and interpretation of data in conducting various survey

### **OUTCOME:**

- Able to acquire and apply knowledge of GIS, its planning, its applications, its components and its characteristics
- Able to apply the knowledge of sampling data in conducting various surveys and analysis

### **SECTION-A**

**Introduction:** Energy-electromagnetic radiation, radiation principles, electromagnetic spectrum, ideal remote sensing system, energy interaction with atmosphere, atmospheric windows, Energy interaction with earth surface feature, spectral signature, Multi concept of remote sensing.

### **SECTION-B**

**Sensor System:** Various types of platforms, different types of sensors, Indian remote sensing systems, data acquisition, spatial, spectral & radiometric resolution, thermal sensors, fundamentals of microwave remote sensing.

### **SECTION-C**

**Digital Image Processing:** Operations involved in Digital Image Processing, source of image acquisition, data preprocessing – atmospheric, radiometric, geometric. Histograms, density slicing, grey level mapping, contrast stretching, filtering, principal component analysis, basic pattern recognition concepts, and discrimination functions. Data Products and Interpretation: Various data products, characteristics, principles of interpretation, ground control points, ground truth.

### **SECTION-D**

**Geographic Information Systems:** Definition, functions of GIS, types of data – spatial, non spatial, point, line, polygon, vector and raster. Database, digitizer, scanner, spatial analysis, overlay, query. Sample analysis, modeling in GIS, DEM, DTM, path analysis. Introduction to GIS packages.

**Application of Remote Sensing and GIS to Water Resources Land Use Land Cover mapping, determination of crop characteristics, ground water, pollutant mapping, snow mapping, rainfall measurement, weather monitoring, soil erosion, soil classification and water shed prioritization, solid waste collection, water supply.**

### **TEXT BOOKS:**

1. Lillesand T M and R W Keifer (1994), “Remote Sensing and Image Interpretation”, John Wiley & Sons, N York
2. Swain P H and S M Davis (1987), “Remote Sensing – The Quantitative Approach”, McGraw-Hill Pub. Co. N York

### **OBJECTIVES:**

- Provide an insight on Railway infrastructure, its planning, its design, its applications, its components and its characteristics
- Explain sampling of data, analysis and interpretation of data in conducting various survey

### **OUTCOME:**

- Able to acquire and apply knowledge of Railway infrastructure, its planning, its design, its applications, its components and its characteristics
- Able to apply the knowledge of sampling data in conducting various surveys and analysis

### **SECTION-A**

#### **Alignment of Railway Lines:**

Modes of transportation, developments in railways, classification of railway lines, rail transportation in India, railway track gauges, choice of gauge, uni-gauge policy, ideal alignment, need for construction of new railway lines, traffic survey, reconnaissance survey, preliminary surveys, and engineering surveys, geometric design, gradients, grade compensation, speeds of trains, curves and super elevation, extra clearance on curves, widening of gauge on curves, cutting rails on curves.

### **SECTION-B**

#### **Permanent Way:**

Requirements, capacity, cross-sections, forces acting on the track, coning of wheels, tilting of rails, function of rails, types of rails, rail wear, defects in rails, creep of rails, rail fixtures and fastenings, ballast, functions, types, sizes, physical properties, sub-grade and formation, slopes of formation, switches, tongue rails, crossing, angle of crossing, turnouts, inspection and maintenance, track junctions and track layouts, symmetrical split, three-throw switch, double turnout, diamond crossing, scissors crossover, gauntleted track, gathering line, triangle, double junctions.

### **SECTION-C**

#### **Track maintenance and Rehabilitation:**

Maintenance tools, maintenance of rail surface, track drainage, maintenance in track circuited lengths, track tolerances, mechanized method of track maintenance, off-track tampers, shovel packing, directed track maintenance, classification of renewal works, through sleeper renewals, mechanized relaying, track renewal trains.

### **SECTION-D**

**Rolling stock:** Types of traction, locomotives and other rolling stock, brake systems, resistance due to friction, wave action, wind, gradient, curvature, starting, Tractive effort of a locomotive, hauling power of a locomotive.

#### **Signaling and interlocking:**

Objectives, classification, fixed signals, stop signals, signaling systems, mechanical signaling system, electrical signaling system, systems for controlling train movement, interlocking, modern signaling installations.

### **Text Books:**

1. Agarwal, M.M. *Indian Railway Track*, Prabha & Co., New Delhi, India, 1988.
2. Chandra S. and M.M. Agarwal *Railway Engineering*, Oxford University Press, New Delhi, India, 2007.
3. Gupta, B.L. *Text Book of Railway Engineering*, Standard Publishers, New Delhi, India, 1982.
4. Rangwala, S.C. *Principles of Railway Engineering*, Charotar Publishing House, Anand, India, 1988.

### **OBJECTIVES:**

- Provide an insight on Highway infrastructure, its planning, its design, its applications, its components and its characteristics
- Explain sampling of data, analysis and interpretation of data in conducting various survey

### **OUTCOME:**

- Able to acquire and apply knowledge of Highway infrastructure, its planning, its design, its applications, its components and its characteristics
- Able to apply the knowledge of sampling data in conducting various surveys and analysis

### **SECTION-A**

**Introduction:** Types and component parts of pavements - Factors affecting design and performance of pavements - Functions and significance of sub grade properties – Various methods of assessment of sub-grade soil strength for pavement design - Cause and effects of variations in moisture content and temperature

### **SECTION-B**

**Design of flexible pavements:** Stresses and deflections in homogeneous masses, Burmister 2 layer and 3 layer theories, Wheel load stresses, ESWL of multiple wheels, Repeated loads and EWL factors, Empirical, semi-empirical and theoretical approaches for flexible pavement design: Group index, CBR, Triaxial, Mcleod and Burmister layered system methods

### **SECTION-C**

**Design of rigid pavements:** Types of stresses in rigid pavements: Wheel load stresses, Warping stresses, Friction stresses, Combined stresses, Factors influencing stresses, Design and detailing of slab thickness - Types of joints in cement concrete pavements: Longitudinal, contraction and expansion joints, Design of Joint Details for Longitudinal Joints, Contraction Joints and Expansion Joints - IRC Method of Design, IRC recommendations.

### **SECTION-D**

**Pavement Evaluation:** Structural and functional requirements of flexible and rigid pavements - Pavement distress, Evaluation of pavement structural condition by Benkelman beam, Rebound deflection and Plate load tests, Introduction to design of pavement overlays, Problems of highway rehabilitation, Pavement rehabilitation programming

### **Text Books:**

1. Khanna S.K. and Justo, CEG, "Highway Engineering", Nem Chand and bros.
2. Yoder and W Nitezak, "Principles of Pavement Design", John Wiley

### **Reference Books:**

1. Yang, "Design of Functional Pavements", McGraw Hill
2. David Croney, "The Design and Performance of Road pavements", HMSO publications
3. Hass and Hudson, "Pavement Management System", McGraw Hill Book Co.

# TRANSPORTATION ENGINEERING

## Pre- Thesis

**AUMTCE-305(T)**

## Pre- Thesis Evaluation

Individual students are required to choose topics of their interest or decided by the guides. The subject contents of the project shall be the topic of current relevance having research aspect or shall be based on study in the industrial visit. At the end of the semester, the students will submit reports duly authenticated by their respective guides, to the Dean/Head of the Department. The evaluation of the Project Work will be made by the Project Assessing Committee (Committee of three, one head of the department and two other teachers of the department including guide) through a viva- voce examination. The committee will submit the report to the Dean/Head within a week.

## Pre- Thesis Assessment Format

[illegible]

**THIRD SEMESTER**  
**ENVIRONMENTAL ENGINEERING**

**Renewable Energy**

**AUMTCE-301(E)**

**OBJECTIVES:**

- Provide an insight on Renewable energy resources, its planning, its components and its characteristics

**OUTCOME:**

- Able to acquire and apply knowledge of Renewable energy resources, its planning, its components and its characteristics

**Section – A**

**Energy sources**, Introduction, classification, energy from biomass, types of biogasplants, constructional details, biogas production and its utilization, agricultural wastes, Principles of combustion, pyrolysis and gasification, types of gasifiers, producer gas and its utilization. Briquettes and uses of Briquettes, `

**Section-B**

**Solar energy**, solar flat plate and focussing plate collectors, solar air heaters, solar space heating and cooling, solar energy applications / solar energy gadgets, Solar cookers, solar water heating systems, solar grain dryers, solar refrigeration system, solar ponds, solar photovoltaic systems, solar lantern, solar street lights, solar fencing, solar pumping systems.

**Section-C**

**Wind energy:** Types of wind mills, constructional details & application of wind mills.

**Section-D**

**Hydraulic ram.** Liquid Bio fuels, bio diesel and Ethanol from agricultural produce, its production & uses.

**TEXT BOOKS:-**

1. Renewable Energy Resource by DR. G.S. Sahwhey

### **OBJECTIVES:**

- Provide an insight on GIS, its planning, its applications, its components and its characteristics
- Explain sampling of data, analysis and interpretation of data in conducting various survey

### **OUTCOME:**

- Able to acquire and apply knowledge of GIS, its planning, its applications, its components and its characteristics
- Able to apply the knowledge of sampling data in conducting various surveys and analysis

### **SECTION-A**

**Introduction:** Energy-electromagnetic radiation, radiation principles, electromagnetic spectrum, ideal remote sensing system, energy interaction with atmosphere, atmospheric windows, Energy interaction with earth surface feature, spectral signature, Multi concept of remote sensing.

### **SECTION-B**

**Sensor System:** Various types of platforms, different types of sensors, Indian remote sensing systems, data acquisition, spatial, spectral & radiometric resolution, thermal sensors, fundamentals of microwave remote sensing.

### **SECTION-C**

**Digital Image Processing:** Operations involved in Digital Image Processing, source of image acquisition, data preprocessing – atmospheric, radiometric, geometric. Histograms, density slicing, grey level mapping, contrast stretching, filtering, principal component analysis, basic pattern recognition concepts, and discrimination functions. Data Products and Interpretation: Various data products, characteristics, principles of interpretation, ground control points, ground truth.

### **SECTION-D**

**Geographic Information Systems:** Definition, functions of GIS, types of data – spatial, non spatial, point, line, polygon, vector and raster. Database, digitizer, scanner, spatial analysis, overlay, query. Sample analysis, modeling in GIS, DEM, DTM, path analysis. Introduction to GIS packages.

**Application of Remote Sensing and GIS to Water Resources Land Use Land Cover mapping,** determination of crop characteristics, ground water, pollutant mapping, snow mapping, rainfall measurement, weather monitoring, soil erosion, soil classification and water shed prioritization, solid waste collection, water supply.

### **TEXT BOOKS:**

1. Lillesand T M and R W Keifer (1994), “Remote Sensing and Image Interpretation”, John Wiley & Sons, N York
2. Swain P H and S M Davis (1987), “Remote Sensing – The Quantitative Approach”, McGraw-Hill Pub. Co. N York

### **OBJECTIVES:**

- To understand the concept of planning of water resources projects including feasibility studies and to learn the concept of relevant mathematical tools.
- To understand the concept of project analysis, issues in planning and data needed for planning.

### **OUTCOME:**

- Able to make use of concept of planning, optimal design criteria and application of economics in water resources projects.
- Able to apply the concepts of linear and dynamic programming in real life problems.

### **SECTION-A**

#### **Water Resources Planning:**

Role of water in national development, assessment of water resources, planning process, Project Planning and long term planning, functional requirements in multipurpose planning.

### **SECTION-B**

#### **Elements of Water Resources Development:**

Reservoir planning-dependable yield, Sequence peak algorithm sedimentation in reservoir, reservoir capacity, empirical-area reduction method.

### **SECTION-C**

#### **Water Resources system engineering:**

Concept of system engineering, optimal policy analysis, linear and dynamic programming, Integrated River Basin Development, Water Resources Planning.

### **SECTION-D**

#### **Application of system approach in water resources:**

Application of system engineering in practical problems like hydrology, irrigation and drainage engineering, mathematical models for forecasting and other water resources related problems.

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### **Text Books:**

- Water Resources Systems Engineering, Hall and Dracup, Mc-Graw Hill.
- Economics of Water Resources Planning, James – Lee, Mc-Graw Hill
- Water Resources Engineering, Linsley and Franzini, Mc-Graw Hill.



### **OBJECTIVES:**

- The primary objective of the course is to familiarize the students with environmental impact analysis.

### **OUTCOME:**

- Able to apply the concepts of linear and dynamic programming in real life problems.

### **SECTION-A**

**Evolution of environmental impact assessment:** (EIA), EIA at project, regional and policy levels, strategic EIA, EIA process, screening and scoping criteria, rapid and comprehensive EIA, specialized areas - environmental health impact assessment and environmental risk analysis. Economic valuation methods and cost-benefit analysis.

### **SECTION-B**

**Practical applications of EIA:** EIA methodologies and baseline data collection

### **SECTION-C**

**Prediction and assessment:** of impacts on physical, biological and socio-economic environment. Environmental management plan, post project monitoring, EIA report and EIS, review process.

### **SECTION-D**

**Case studies on project:** regional and sectoral EIA, legislative and environmental clearance procedures in India and other countries, sitting criteria, CRZ, public participation, resettlement and rehabilitation.

### **Text Books:**

1. B. M. Noble, "Introduction to Environmental Impact Assessment: A Guide to Principles and Practice", Oxford University Press, USA.
2. J. Glasston, "Introduction to Environmental Impact Assessment: Principles, and Procedures, Process, Practice and Prospects (The Natural and Built Environment Series)", Routledge.

### **Reference Books:**

1. P. Morris, "Methods of Environmental Impact Assessment (The Natural and Built Environment Series)", Spon Press, USA.
2. R. K. Jain, L. V. Urban, G. S., Stacey, Harold, E. Balbach, "Environmental Assessment", McGraw-Hill Professional.

**AUMTCE-305(E)**

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**THIRD SEMESTER**  
**CONSTRUCTION TECHNOLOGY ENGINEERING**

**Bridge Engineering**

**AUMTCE-301(C)**

**OBJECTIVES:**

- Provide an insight on Bridge infrastructure, its planning, its design, its applications, its components and its characteristics
- Explain sampling of data, analysis and interpretation of data in conducting various survey

**OUTCOME:**

- Able to acquire and apply knowledge of Bridge infrastructure, its planning, its design, its applications, its components and its characteristics
- Able to apply the knowledge of sampling data in conducting various surveys and analysis

**SECTION-A**

**Investigation of Bridges:** Definition, classifications, selection of bridge site, preliminary data to be collected, design discharge and its determination, linear waterway, economical span, vertical clearance above HFL, scour depth and choice of bridge type.

**Standard Specifications:** Road bridges, I.R.C. loadings, code provisions for carriageway width, clearances, loads considered, etc. Standard specifications for railway bridges, railway bridge code.R.C.C. culvert.

**SECTION-B**

**Reinforced Concrete Bridges:** T-beam bridge, Courbon's theory for load distribution, balanced cantilever bridges, pre-stressed concrete bridges, (General discussions).

**SECTION-C**

**Steel Bridges:** Introduction to suspension bridges, cantilever bridges, cable stayed bridges, general arrangement of single-track broad-gauge railway bridge with open floor, design of stringers, cross girders, main trusses, top and bottom lateral bracing, complete design of through type truss bridge.

Sub Structure: Types of piers and abutments, design forces, design of piers and abutments.

**SECTION-D**

**Bearing and Joints:** Various types of expansion bearing and fixed bearings, elastomeric bearings, joints and their types, design of bearings, inspection and maintenance of bridges.

**Text Books:**

1. Johnson Victor, D, "Elements of Bridge Engineering", Oxford and IBH Publishing Co., Ltd.
2. Rishnaraju, N, "Design of Bridges", Oxford and IBH Publishing Co., Ltd.

**References:**

1. Raina, V. K. "Analysis, Design and Construction of Bridges", Tata McGraw-Hill Publication.
2. Vazirani, Ratvani & Aswani, —Design of Concrete Bridges, Khanna Publishers.
3. Jagadish T.R. & M.A. Jayaram, —Design of Bridge Structures, Prentice Hall India Pvt., Ltd.

### **OBJECTIVES:**

- Provide an insight on GIS, its planning, its applications, its components and its characteristics
- Explain sampling of data, analysis and interpretation of data in conducting various survey

### **OUTCOME:**

- Able to acquire and apply knowledge of GIS, its planning, its applications, its components and its characteristics
- Able to apply the knowledge of sampling data in conducting various surveys and analysis

### **SECTION-A**

**Introduction:** Energy-electromagnetic radiation, radiation principles, electromagnetic spectrum, ideal remote sensing system, energy interaction with atmosphere, atmospheric windows, Energy interaction with earth surface feature, spectral signature, Multi concept of remote sensing.

### **SECTION-B**

**Sensor System:** Various types of platforms, different types of sensors, Indian remote sensing systems, data acquisition, spatial, spectral & radiometric resolution, thermal sensors, fundamentals of microwave remote sensing.

### **SECTION-C**

**Digital Image Processing:** Operations involved in Digital Image Processing, source of image acquisition, data preprocessing – atmospheric, radiometric, geometric. Histograms, density slicing, grey level mapping, contrast stretching, filtering, principal component analysis, basic pattern recognition concepts, and discrimination functions. Data Products and Interpretation: Various data products, characteristics, principles of interpretation, ground control points, ground truth.

### **SECTION-D**

**Geographic Information Systems:** Definition, functions of GIS, types of data – spatial, non spatial, point, line, polygon, vector and raster. Database, digitizer, scanner, spatial analysis, overlay, query. Sample analysis, modeling in GIS, DEM, DTM, path analysis. Introduction to GIS packages.

**Application of Remote Sensing and GIS to Water Resources Land Use Land Cover mapping,** determination of crop characteristics, ground water, pollutant mapping, snow mapping, rainfall measurement, weather monitoring, soil erosion, soil classification and water shed prioritization, solid waste collection, water supply.

### **TEXT BOOKS:**

1. Lillesand T M and R W Keifer (1994), “Remote Sensing and Image Interpretation”, John Wiley & Sons, N York
2. Swain P H and S M Davis (1987), “Remote Sensing – The Quantitative Approach”, McGraw-Hill Pub. Co. N York

## Design of Pre- Stressed Concrete Structures

**AUMTCE-303(C)**

### **OBJECTIVES:**

- Provide an insight on Pre-stressed concrete, its planning, its applications, its components and its characteristics

### **OUTCOME:**

- Able to acquire and apply knowledge of Pre-stressed concrete, its planning, its applications, its components and its characteristics

### **SECTION-A**

**Introduction:** Basic concepts of prestressing, terminology, applications. Materials for prestressing: High strength concrete, permissible stresses in concrete, high strength steel, permissible stresses in steel.

**System of pre-stressing:** Pre-tensioning and post tensioning systems, tensioning devices, Lec-Macall systems, Magnel Blaton post tensioning, Freyssinet systems, Gifford Udal system.

### **SECTION-B**

**Losses of Prestress:** Types of losses of prestress, loss due to elastic deformation of concrete, shrinkage, creep, relaxation of stress in steel, friction, anchorage slip. Total loss in pretensioned and post tensioned members.

**Analysis of Prestress and Bending stresses:** Basic assumptions, resultant stresses at a section, concept of load balancing, cracking moment.

### **SECTION-C**

**Deflections:** Factors influencing deflections, short term deflections of un-cracked members, deflections of cracked members, prediction of long term deflections.

**Shear and Torsional Resistance:** Ultimate shear resistance of pre stressed concrete members, pre stressed concrete members in torsion, design of reinforcements for torsion, shear and bending.

### **SECTION-D**

**Design of Flexural Members:** Dimensioning of flexural members, design of pre- tensioned and post tensioned beams, design of partially pre stressed members, design of one way and two way slabs, continuous beams. Design for axial tension, compression and bending, bond and bearing.

### **Text Books:**

1. Krishnaraju .R, "Prestressed Concrete", Tata McGraw-Hill Education, New Delhi.
2. Pandit, G. S., Gupta, S. P., "Prestressed Concrete", CBS Publishers & Distributors.
3. Rajagopalan .N, "Prestressed Concrete", Alpha Science International, Limited.

### **Reference Books:**

1. Lin T.Y, Design of, "Prestressed Concrete Structures", Asia Publishing House, Bombay.
2. Guyon .V, "Limit State Design of Prestressed Concrete", Vol.I& II Applied Science Publishers, London.
3. IS: 1343- 1980, "IS Code Of Practice For Prestressed Concrete", BIS, New Delhi.

# **CONSTRUCTION TECHNOLOGY ENGINEERING**

## **Concrete Technology**

**AUMTCE-304(C)**

### **OBJECTIVES:**

- Provide an insight on concrete, its planning, its applications, its components and its characteristics

### **OUTCOME:**

- Able to acquire and apply knowledge of concrete, its planning, its applications, its components and its characteristics

### **SECTION-A**

**Grades of Concrete:** Concrete for ordinary work, light weight concrete, high density concrete, workability, durability and strength requirements, effect of w/c ratio, acceptability criteria, laboratory testing of fresh and hardened concrete.

**Concrete Mix Design:** Mix design for compressive strength by I.S. methods.

### **SECTION-B**

**High Performance Concrete:** Constituents of high grade concrete, various tests and application of high performance concrete.

**Admixtures:** Plasticizers, retarders, accelerators and other admixtures, test on admixtures, chemistry and compatibility with concrete.

### **SECTION-C**

**Ready Mix Concrete:** Requirements of ready mix concrete, transit mixer details, mix design of RMC.

**Concrete for Repairs and Rehabilitation of Structures:** Polymer concrete, fiber reinforced concrete, polymer impregnated concrete, polymer modified cement concrete and Ferro cement, different tests.

### **SECTION-D**

**Non-Destructive Testing of Concrete:** Hammer test, ultrasonic pulse velocity test, load test, carbonation test, half cell potential-meter, corrosion of steel, core test and relevant provision of I.S. codes.

### **Text Books:**

1. Concrete technology, theory and practice", M.S. Shetty

### **Reference Books:**

1. Properties of concrete, Neville, El, Society & Pub.
2. Relevant I.S. codes.
3. Special Publication of ACI on Polymer concrete and FRC.

# CONSTRUCTION TECHNOLOGY ENGINEERING

## Pre- Thesis

**AUMTCE-305(C)**

## Pre- Thesis Evaluation

Individual students are required to choose topics of their interest or decided by the guides. The subject contents of the project shall be the topic of current relevance having research aspect or shall be based on study in the industrial visit. At the end of the semester, the students will submit reports duly authenticated by their respective guides, to the Dean/Head of the Department. The evaluation of the Project Work will be made by the Project Assessing Committee (Committee of three, one head of the department and two other teachers of the department including guide) through a viva- voce examination. The committee will submit the report to the Dean/Head within a week.

## Pre- Thesis Assessment Format

[illegible]

## **FOURTH SEMESTER**

### **Thesis/Dissertation**

**AUMTCE-401**

#### **Thesis/Dissertation Evaluation**

Each student is to carry out the Dissertation work for which topic will be assigned at the end of the third semester by his/her guide. The main objective of dissertation is to provide the original and independent study/research to demonstrate ability of using analytical approach independently. Thesis will be prepared by each student under the supervision of his/her Guide and be submitted at the end of fourth semester. The dissertation will be evaluated through viva-voce examination and seminar by Dissertation Assessing Committee. The committee will be constituted by Dean/Head of the Department (one Head and other two teachers of the department including Guide).The committee will submit the report within a week. The dissertation will be evaluated through a viva –voce examination as per the following format.

#### **Thesis/Dissertation Assessment Format**

Sr. No.	Name of the Student	Class	Regd. No.	Topic	Topic Contents	Knowledge of the topic	Answers to questions	Average	Remarks.

### **Certificate**

(To be used in Dissertation Thesis)

This is to certify that Dissertation entitled, “\_\_\_\_\_” submitted by\_\_\_\_\_ Registration No.\_\_\_\_\_ University Roll No.\_\_\_\_\_ in partial fulfillment of the degree of Master in Technology (Civil/ Mechanical)of Abhilashi University,ChailChowk, Chachyot, Mandi, H.P. is a bonafide and original research work carried out by him/her under my supervision and guidance during the academic year\_\_\_\_\_. No part of this dissertation has been submitted to any other University for any other degree.

**Supervisor**