NATIONAL INSTITUTE OF TECHNOLOGY WARANGAL

Minor in

CIVIL ENGINEERING

SCHEME OF INSTRUCTION AND SYLLABI

(for B.Tech. students other than Civil Engineering)

(Effective from 2021-22)

DEPARTMENT OF CIVIL ENGINEERING

SCHEME OF INSTRUCTION

Minor Program – Civil Engineering

S. No.	Course Code	Name of the Course	L	T	P	Credits	Sem.
1	CEM01	Geomatics	3	0	0	3	III
2	CEM02	Building Construction Practices	3	0	0	3	IV
3	CEM03	Elements of Structural Engineering	3	0	0	3	V
4	CEM04	Hydrology and Environmental Engineering	3	0	0	3	VI
5	CEM05	Soil and Foundation Engineering	3	0	0	3	VII
6	CEM06	Transportation Engineering	3	0	0	3	VIII
		Total				**18**	

DETAILED SYLLABUS

Minor – Civil Engineering

Course Code: CEM01	GEOMATICS	Credits 3-0-0: 3

Pre-requisites: None

Course Outcomes: At the end of the course, the student will be able to:

CO1	Map the geospatial features
CO2	Identify different navigation systems and constellations
CO3	Acquire and process geospatial data
CO4	Prepare geospatial features in computing environment

Syllabus:

Introduction to Geomatics: Definition, disciplines and techniques constituting Geomatics, Elements of Cartography- Earth shape, Reference systems and Coordinate systems, Scale, Map Classification and Map reading.

Land Surveying: Definition, Principles, Distance measuring instruments and methods, Angle measuring instruments and methods, Leveling and Contouring, Applications, Types of maps

Remote Sensing: Definition- Electromagnetic spectrum-Energy interactions with atmosphere and earth surface features-spectral reflectance of vegetation, soil and water- Classification of sensors, Active and Passive, Resolution-spatial, spectral radiometric and Temporal resolution, Multi spectral scanning-Along track and across track scanning, Earth observation satellites

Global Navigation Satellite System: Types, GNSS-Components and Principles, Satellite ranging-calculating position, GNSS measurement techniques, Phases of GPS Survey - Planning and preparation, GPS errors and biases, Other navigation systems, Regional navigation systems

Geographical Information System: components of GIS, GIS operations, Modelling Real World Features Data, Data Models – Spatial and Non-spatial, Components, Data Collection and Input, Data Conversion, Metadata.

Learning Resources:

Text Books:

1. Surveying Vol I & II, B.C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi publications (P) Ltd, 2005
2. Surveying Vol. II, S.K. Duggal, Tata McGraw Hill Ltd, Reprint 2015
3. Introduction to GIS, Kang-Tsung Chang, Tata McGraw-Hill Publishing Co. Ltd, 8e, 2016
4. Remote Sensing and Image Interpretation, Lillesand M and Kiefer W, John Wiley and Sons, Inc., 2015

Reference Books:

1. Introduction to Geographic Information Systems, Chang,K , Tata McGraw-Hill Publishing Co. Ltd, 2008
2. Surveying Theory and Practice, James M Andersen, Edward M Mikhail, McGraw Hill education, 7e, 2014

Online Resources:

1. https://nptel.ac.in/courses/105/108/105108077/
2. https://nptel.ac.in/courses/105/102/105102015/

Course Code: CEM02	BUILDING CONSTRUCTION PRACTICES	Credits 3-0-0: 3

Pre-requisites: None

Course Outcomes: At the end of the course, the student will be able to:

CO1	Comprehend the different components of building
CO2	Study the construction practices and techniques for the different components of buildings
CO3	Comprehend the use of Formwork in construction
CO4	Plan the sequence of construction of Buildings

Syllabus:

Types of Buildings, Components of buildings, Foundation and its functional requirements, Characteristics of soil, types of foundations, construction of foundation

Masonry: Definitions of terms used in masonry, Materials used, Stone masonry, Brick masonry, Different bonds used for brick masonry

Floors, Roofs and Staircases: Components of a floor, materials used for floor construction, Different types of flooring, Types of roofs, Basic roofing elements and Roof coverings, Functional requirements of a good stair, type of steps, type of stairs, planning a staircase.

Formwork in Construction: Requirements of Formwork, Types of formwork, Timber, Steel, Modular shuttering, Slip forms, Scaffolding.

Planning for Construction, Selection of site for building construction, Sequence of construction

Learning Resources:

Text Books:

1. Building construction, Varghese P. C. PHI Learning Pvt. Ltd., 2016, Second Edition.
2. Building construction, Punmia B. C., Jain A. J. and Jain A. J ,Laxmi Publications, 2016, Eleventh Edition

Reference Books:

1. The text book of building construction, Arora S. P., and Bindra S. P. Dhanpat Rai Publications, 2010
2. Handbook on Building Construction Practices (Excluding Electrical Work), SP62 (1997), Bureau of Indian Standards.

Online Resources:

1. https://www.youtube.com/watch?v=5kt0t5AQBZw
2. https://www.youtube.com/watch?v=XaHpTvUfnfQ
3. https://www.youtube.com/watch?v=IuzFgCRBTiQ

Course Code: CEM03	ELEMENTS OF STRUCTURAL ENGINEERING	Credits 3-0-0: 3

Pre-requisites: None

Course Outcomes: At the end of the course, the student will be able to:

CO1	Visualize, conceptualize and synthesize structural elements
CO2	Analyse structural elements for bending, shear and torsion
CO3	Apply design concepts to structural steel elements
CO4	Apply design concepts to RCC elements

Syllabus:

Introduction to Structural Engineering Concepts: Types of structures, Geometrical and structural classification, Material laws, Laws of structural mechanics, Action and displacement in structures- examples simply supported / hinged beam, Cantilever beam, Use of principle of superposition, Visualize, Conceptualize and Synthesize structural elements

Concepts of Bending and shear stresses: Assumptions - Theory of Simple Bending - Bending stresses in beams – Flexural shear stress distribution in various shapes of cross section of beams.

Analysis of structural elements: Combined action of bending and shear, shear and torsion, concept of principal stress and strain, structural analysis using tables and charts. Examples on continuous beams.

Methods of Structural steel design and its principles: Introduction-Types of loads- Design Philosophies- working stress method, Limit State Method, Safety factors for Materials and Loads-Indian Standards, Standard sections, General concept in the design of structural elements- tension, compression, beam, column and floor elements

Concepts of RCC Design: Introduction- Design Philosophies- working stress method, Limit State Method, Safety factors for Materials and Loads-Indian Standards, General concept in the design of structural elements- tension, compression, beam, column and floor elements.

Learning Resources:

Text Books:

1. Engineering Mechanics (In SI Units), S. Timoshenko, D.H. Young, J.V. Rao and Sukumar Pati, McGraw Hill Publishers, 2017, 5th Edition.
2. Mechanics of Structures Vol 1 (Strength of Material), S. B. Junarkar and H. J. Shah, Charotar Publishing House Pvt. Ltd., 2012.
3. Design of Steel Structures, L S Negi, Tata Mc Graw Hill Publishers, 2017.
4. Design Of Reinforced Concrete Structures, IS:456-2000, N.Krishnaraju, CBS Publications, 2019, 4th Edition

Reference Books:

1. Strength of Materials - Pytel & Singer, Harper & Row Publishers, 4th Edition, 2018.
2. Mechanics of Materials (SI Edition), R. C. Hibbeler, Pearson Publications, 2018.
3. Limit State Design of Steel Structures, S K Duggal, Tata Mc Graw Hill Publishers, 2019, 3rd Edition.
4. Reinforced Concrete Design, Devdas Menon , S. Pillai, Tata McGraw Hill Pub., 2017, 3rd Edition

Online Resources:

1. https://nptel.ac.in/courses/122/104/122104015/
2. https://nptel.ac.in/courses/112/106/112106180/
3. https://nptel.ac.in/courses/105/105/105105108/
4. https://nptel.ac.in/courses/105/106/105106172/
5. https://nptel.ac.in/courses/105/105/105105162/
6. https://nptel.ac.in/courses/105/105/105105105/

Course Code: CEM04	HYDROLOGY AND ENVIRONMENTAL ENGINEERING	Credits 3-0-0: 3

Pre-requisites: None

Course Outcomes: At the end of the course, the student will be able to:

CO1	Comprehend the components of hydrologic cycle
CO2	Explain the various hydrological processes
CO3	Estimate yield from surface and subsurface resources
CO4	Assess water demand and identify the components of water treatment systems
CO5	Estimate the wastewater quantity and comprehend the components of wastewater treatment systems

Syllabus:

Description of Hydrologic Cycle, Components of hydrologic cycle, Forms and types of precipitation, Abstractions from Precipitation, Evaporation, Evapotranspiration, Infiltration process, and effective rainfall.

Stream flow, flow duration curve and flow mass curve, Hydrograph, Basics of unit hydrograph theory, Concepts of flood routing and flood frequency analysis, Occurrence of groundwater, types of aquifers, aquifer properties.

Estimation of water demand, water consumption rate, fluctuations in rate of demand, design period, population forecasting methods, working principles and design of water treatment units, screening, plain sedimentation, sedimentation aided with coagulation, filtration, disinfection, water softening, miscellaneous treatments, water distribution.

Wastewater Collection and transfer, Preliminary & primary treatment of wastewater, secondary treatment of wastewater, disposal.

Learning Resources:

Text Books:

1. Engineering Hydrology, Subramanya, K., Tata McGraw Hill Publications, 5th Edition, 2020
2. Environmental Engineering, Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, McGraw Hill Education, 2017 First Indian Edition

Reference Books:

1. Environmental Engineering (Vol. I): Water supply Engineering, P.N. Modi, Standard Book House, 2018, 5th Edition
2. Environmental Engineering (Vol.II): Sewage Disposal and Air Pollution Engineering, S.K. Garg, Khanna Publishers, 1999, 40th Edition
3. Introduction to Hydrology, Viessman, W., and Lewis, G.L., Prentice Hall of India, 2008

Online Resources:

1. http://cpheeo.gov.in/cms/manual-on-water-supply-and-treatment.php
2. http://cpheeo.gov.in/cms/manual-on-operation--and-maintenance-of-water-supply-system-2005.php
3. http://cpheeo.gov.in/cms/manual-on-storm-water-drainage-systems---2019.php
4. https://nptel.ac.in/courses/105/105/105105201/
5. https://nptel.ac.in/courses/105/106/105106119/
6. https://nptel.ac.in/courses/105/104/105104102/

Course Code: CEM05	SOIL AND FOUNDATION ENGINEERING	Credits 3-0-0: 3

Pre-requisites: None

Course Outcomes: At the end of the course, the student will be able to:

CO1	Comprehend the soil as a natural supporting and construction material
CO2	Calculate 3-phase soil parameters and classify the soils
CO3	Apply effective stress principle to engineering works
CO4	Apply the principles of soil compressibility and settlements
CO5	Comprehend the significance of shear strength and different types of foundations

Syllabus:

Introduction: Soil formation- Development of soil engineering - Importance of soil engineering- Major soil deposits of India and their engineering concerns.

Phase Soil System: 3-phase diagram, basic definitions and formulations, Index properties and soil classification.

Soil – water: Types of soil- water, permeability of soils, effective stress principle, Estimation of effective stress for different field conditions.

Compressibility and shear strength of Soils: a) Stresses in soil under applied loads.
b) Compaction of soils – Purpose, IS light and Heavy compaction, compaction quality control.
c) Consolidation of soils- Definitions, total settlement and rate of settlement.
d) Shear strength: Definition and significance of shear strength - Source of shear strength, Mohr's stress circle.

Types of foundations and Bearing Capacity: Importance of bearing capacity, Shallow foundations and Deep foundations, their suitability and selection.

Learning Resources:

Text Books:

1. Basic and Applied Soil Mechanics, Gopal Ranjan and A.S.R. Rao, New Age Int. Publishers,2019, 3rd Edition.
2. Geotechnical Engineering, V.N.S. Murthy, CBS Publishers, 2018, First Edition.
3. Principles of Foundation Engineering, Braja.M. Das, Cengage Learning India Private Limited, 2011, Seventh Edition

Reference Books:

1. Introduction to Geotechnical Engineering, Braja M. Das and N. Sivakugan, Cengage Learning, 2015, Second Edition.
2. Geotechnical Engineering, C. Venkata Ramaiah, 2019, New Age Int. Publishers, New Delhi.

Online Resources:

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

Course Code: CEM06	TRANSPORTATION ENGINEERING	Credits 3-0-0: 3

Pre-requisites: None

Course Outcomes: At the end of the course, the student will be able to:

CO1	Differentiate different systems of transportation
CO2	Estimate travel demand
CO3	Analyze the traffic flow data and propose road safety measures.
CO4	Design highway geometrics and flexible pavement
CO5	Appraise different intelligent transportation systems to ensure effective traffic

Syllabus:

Transportation Systems: Role of transport in national development, the transportation system, modes of transportation and their characteristics, urban and regional transportation problems, travel characteristics, transport development plans, highway classification, and network patterns.

Travel Demand: Issues related to regional and urban transportation planning, long-term and short-term plans, travel attributes**,** data Collection, four stage travel demand forecasting, Trip Generation Model, Trip Distribution Model, Mode Split Model and Traffic Assignment Technique.

Traffic Engineering and Safety: Traffic characteristics, flow-speed-Density, q-k-v relationships, road traffic studies and analysis, hourly design volume, types of intersections and design considerations, Traffic Signs and Signals, road accidents and measures, Road Safety Analysis and Audit.

Highway Design: Highway alignment, engineering surveys, design control and criteria, ross-sectional elements, sight distances, design of horizontal and vertical curves.
Types of pavement structures, functions of pavement component layer, basic properties of soil, aggregates, and bitumen, overview of bituminous mix design, Design of Flexible Pavement

Smart Mobility: Intelligent transportation Systems, advanced vehicle control and safety systems, electronic toll collection, Traveler Information System, Autonomous vehicles, electric trucks, hyperloop and drones.

Learning Resources:

Textbooks:

1. Highway Engineering, Khanna, S.K., Justo C.E.G., and Veeraragavan A., Nem Chand and Bros., Roorkee, India, 2017, Tenth Edition.
2. Traffic Engineering and Transport Planning, Kadiyali L.R., Khanna Publishers, New Delhi, India, 2018, Ninth Edition.

Reference Books:

1. Highway Engineering, Daniel Jonathan Findley, Bastian J. Schroeder, Christopher Michael Cunningham Thomas H. Brown, Jr. Maximize., 2015.
2. Introduction to Transportation Systems, Joseph Sussman., 2000.
3. Principles of Transportation Engineering, Chakroborty, P. and Animesh Das., Prentice Hall of India Pvt. Ltd, New Delhi, India, 2017, Second Edition.
4. Fundamentals of Transportation Engineering, Papakostas. C.S., Pearson Education India, 2015, Third Edition.

Online Resources:

1. https://nptel.ac.in/courses/105/101/105101087/
2. https://www.youtube.com/watch?v=5zKC_aq4ypM
3. https://ocw.mit.edu/courses/civil-and-environmental-engineering/
4. https://www.citt.ca/students/courses/tslinks.html