

**DETAILED SYLLABUS**  
**FOR**  
**5<sup>th</sup> Semester B. TECH PROGRAMME**  
**IN**  
**CIVIL ENGINEERING**

FOR 2018-9019  
ADMISSION BATCH ONWARDS



**BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ODISHA**

Chhend Colony, Rourkela

ODISHA-769004

  
**Principal**  
**Radhakrishna Institute of Technology**  
**and Engineering, Bhubaneswar**

B. Tech in Civil Engineering (Admission Batch: 2018-2019)

**5<sup>th</sup> Semester**

<b>Fifth Semester</b>					
Theory					
Sl. No.	Category	Course Code	Course Title	L-T-P	Credit
1	PC 11		Design of Concrete Structures	3-0-0	3
2	PC 12		Water and Waste Water Engineering	3-0-0	3
3	PC 13		Geotechnical Engineering	3-0-0	3
4	PE 2		Structural Analysis-II.	3-0-0	3
			Advance Mechanics of Material	3-0-0	
			Masonry Structure	3-0-0	
5	PE 3		Railway and Airport Engineering	3-0-0	3
			Pavement Design	3-0-0	
			Traffic Engineering	3-0-0	
6	MC 5		Universal Human Values		0
<b>Total Credit (Theory)</b>					<b>15</b>
Practical					
1	PC 14		Design of Concrete Structures Lab	0-0-3	2
2	PC 15		Water and Waste Water Engineering Lab	0-0-3	2
3	PC 16		Geotechnical Engineering Lab	0-0-3	2
4	PSI 2		Evaluation of Summer Internship	0-0-3	1
<b>Total Credit (Practical)</b>					<b>7</b>
<b>Total Semester Credit</b>					<b>22</b>



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## Water and Waste Water Engineering (3-0-0)

### Module – I

(08 Classes)

General requirement for water supply, sources, quality of water, intake, pumping and transportation of water.

### Module – II

(06 Classes)

Physical, chemical and biological characteristics of water and their significance, water quality criteria, water borne diseases, natural purification of water sources.

### Module – III

(08 Classes)

Engineered systems for water treatment : aeration, sedimentation, softening coagulation, filtration, adsorption, ion exchange, and disinfection. Design of water distribution system.

### Module – IV

(08 Classes)

Generation and collection of waste water, sanitary, storm and combined sewerage systems, quantities of sanitary waste and storm water, design of sewerage system Primary, secondary and tertiary treatment of wastewater. Waste water disposal standards,

### Module – V

(10 Classes)

Basic of microbiology. Biological wastewater treatment system : Aerobic processes activated sludge process and its modifications, trickling filter, RBC, Anaerobic Processes conventional anaerobic digester, High rate and hybrid anaerobic reactors, Sludge digestion and handling, Disposal of effluent and sludge, Design problems on water distribution, sewerage, water treatment units, wastewater treatment units and sludge digestion.

### Books:

1. Water Supply Engineering-Environmental Engineering v.1 by S.K.Garg, Khanna Publishers
2. Sewage Disposal and Air Pollution Engineering - Environmental Engineering v.2 by S.K.Garg, Khanna Publishers
3. Water Supply and Sanitary Engineering by B.S.BirdiDhanpat Rai Publishing Company
4. Water Supply Engineering by B. C. Punmia and A.K.Jain, Laxmi Publications
5. Water and Wastewater Technology by M.J.Hammer, PHI

### Digital Learning Resources:

Course Name	WATER SUPPLY ENGINEERING, Waste water Treatment and Recycling
Course Link	<a href="https://nptel.ac.in/courses/105/105/105105201">https://nptel.ac.in/courses/105/105/105105201</a> ( <a href="https://nptel.ac.in/courses/105/105/105105178/">https://nptel.ac.in/courses/105/105/105105178/</a> )
Course Instructor	PROF. MANOJ KUMAR TIWARI Department of Civil Engineering IIT Kharagpur

  
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## Geotechnical Engineering- I (3-0-0)

### Module-I

( 8 classes)

Origin of Soil: Rock Cycle and the origin of soil, clay mineralogy, mechanical analysis of soil, grain size distribution curve, particle shape and size, weight volume relationships, specific gravity, unit weight, void ratio, moisture content, and relationships, relative density. Consistency of soil: Atterberg limits - Liquidity index and consistency index, activity, soil structure. Engineering classification of soil: Types of Soil classification, IS, USCS, HRB and ASTM.

### Module-II

( 8 classes)

Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships.

Permeability - Bernoulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, Factors affecting hydraulic conductivity, equivalent hydraulic conductivity in stratified soil.

Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition.

### Module-III

(6 classes)

Soil Compaction: mechanism and principles, Laboratory compaction, factors affecting compaction, effect of compaction on soil properties, field compaction techniques.

### Module-IV

(12 classes)

Stress Distribution: Normal and shear stresses on a plane, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, Newmark's chart and its application, contact pressure.

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination: direct and tri-axial shear test, unconfined compression test, vane shear test. Other methods of determining the un-drained shear strength of soil, sensitivity and thixotropy of clay.

### Module-V

(6 classes)

Consolidation of soils: Consolidation and compaction, primary and secondary consolidation, Terzaghi's theory of one dimensional consolidation, consolidation test, coefficient of consolidation.

### Books:

1. Principles of Geotechnical Engineering by Braja M. Das, Cengage Learning
2. Soil Mechanics and Foundation Engineering, by K.R. Arora, Stanard Publishers
3. Soil Mechanics and Foundation Engineering by B.N.D. NarasingaRao, Wiley India Pvt.Ltd.
4. Basic and applied soil mechanics, by Gopal Ranjan, A S R Rao New Age International Publishers

### Digital Learning Resources:

Course Name	GEOTECHNICAL ENGINEERING- I
Course Link	( <a href="https://nptel.ac.in/courses/105/101/105101201">https://nptel.ac.in/courses/105/101/105101201</a> )
Course Instructor	Prof. Devendra Narain Singh, IIT Bombay 12 week

  
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## Traffic Engineering (3-0-0)

### MODULE-I

(08 Classes)

#### TRANSIT SYSTEM AND ISSUES

Introduction to Mass Transport, Role of various modes of Mass Transport, Transport System Performance at National, State, Local and International levels, National Transport Policy, Urban transportation problems and their impact, Modes of mass transit- their planning, construction and operation, Case studies of existing mass transit systems

Technical and economic evaluation of mass transit projects

### MODULE-II

(08 Classes)

#### PUBLIC TRANSIT SYSTEM

Urban Transport System, Public Transport System Re-gensis and Technology, Physical performance of Public Transport System, Public Transport and Urban Development Strategies, Mass Transit concepts- Trip interchanges and assignments, Characteristics of Rail Transit, Vehicle Characteristics

### MODULE-III

(08 Classes)

#### BUS TRANSIT PLANNING AND SCHEDULING

Route Planning and Scheduling, Bus Transport System, Performance and Evaluation, Scheduling, Conceptual patterns of bus service, Network Planning and Analysis, Bus Transport System Pricing, Bus Transit System Integration, Analytical Tools and Techniques for Operation and Management, Bus Rapid Transit Systems, Case Studies

### MODULE-IV

(06 Classes)

#### RAIL TRANSIT TERMINALS AND PERFORMANCE EVALUATION

Performance Evaluation, Efficiency, Capacity, Productivity and Utilisation, Performance Evaluation Techniques and Application, System Network Performance, Transit Terminal Planning and Design

### MODULE-V

(10 Classes)

#### IMPACT OF TRANSIT

Policies and Strategies for Mass Transport, Need for Integrated Approach, Unified Transport Authorities, Institutional arrangement, Urban Transport Fund, Parking Policies, Private Sector in Mass Transport, Bus and Rail Integration, Co-ordination of Feeder Services, Transit Oriented Land Use Development., Case Studies, Urban Transportation and Land use, Impact of Transport Development on Environment, Remedial measures, Policy Decisions, Recent Trends in Mass Transportation Planning and Management

#### Books

1. Michael J.Bruton , "An Introduction to Transportation Planning", Hutchinson,1985
2. Michael D.Meyer and Eric J.Miller , "Urban Transportation Planning – A Decision Oriented Approach", McGraw Hill Book Company, New York,1984
3. F.D.Hobbs, "Traffic Planning and Design", PoargamonOress
4. John W.Dickey, "Metropolitan Transportation Planning" – Tata McGraw Hill Publishing Company Limited, New Delhi, 1980
5. Paul H.Wright, "Transportation Engineering – Planning and Design", John Wiley and Sons, New York, 1989.

#### Digital Learning Resources:

Course Name	Urban transportation planning
Course Link	<a href="https://nptel.ac.in/courses/105/107/105107067/">https://nptel.ac.in/courses/105/107/105107067/</a>
Course Instructor	Dr. M. Parida IIT Roorkee

  
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## 5<sup>th</sup> Semester

### Universal Human Values (Self, Society and Nature)

**Pre-requisites:** Universal Human Values: Self & Family (desirable); 4-day Harmony-2 Workshop (co-requisite). Please refer to AICTE Model Curriculum-Vol-II.

#### 1. Objective:

The objective of the course is four-fold:


- A. Sensitization of student towards issues in society and nature.
- B. Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals.
- C. Strengthening of self reflection.
- D. Development of commitment and courage to act.

(For elaboration on some of the above, consult course description for Universal Human Values 1: Self and Family, AICTE Model Curriculum-VOL-II).

#### 2. Course Topics :

In this Universal Human Values course, the focus is more on understanding society and nature on the basis of self and human relationships.

- i) Purpose and motivation for the course.
- ii) Recapitulation (from the previous course) on ideas of self, pre-conditioning, and natural acceptance.
- iii) Harmony in the self. Understanding human being as co-existence of self and body. Identifying needs and satisfying needs of self and body. Self-observations. Handling peer pressure.
- iv) Recapitulation on relationships. Nine universal values in relationships. Reflecting on relationships in family. Hostel and institute as extended family. Real life examples.
- v) Teacher-student relationship. Shraddha. Guidance. Goal of education.
- vi) Harmony in nature. Four orders of nature – material order, plant order, animal order and human order. Salient features of each. Human being as cause of imbalance in nature. (Film “Home” can be used.)
- vii) Human being as cause of imbalance in nature. Depletion of resources – water, food, mineral resources. Pollution. Role of technology. Mutual enrichment not just recycling.
- viii) Prosperity arising out of material goods and understanding of self. Separation of needs of the self and needs of the body. Right utilization of resources. lkekU; vkdkka {kk ,oa egRokdkka {kk, Understanding the purpose they try to fulfil.

  
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- (b) **Exemplification in society:** This stage demonstrates a **basic society**. Fulfillment of its individual as major goal. Justice in society. Equality in human relationships is generally acceptable. Institutionalization of society with others (absence of fear).
- (c) **Critical human condition:** Values, interests and activities.
- (d) **Professional ethics:** Conflict in an organism or individual.

*S. S. S.*  
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K. J. Somaiya Institute of Technology  
and Engineering, Vashi, Mumbai

## WATER SUPPLY AND SANITARY ENGINEERING LAB

### LIST OF EXPERIMENTS:

#### 1. Analysis of water Quality Parameter

- a) Measurement of pH, Electrical conductivity
- b) Determination of Turbidity of water samples.
- c) Determination of Chlorides in water.
- d) Determination of Iron and Fluoride in water.
- e) Determination of Acidity and Alkalinity of water.
- f) Determination of Sulphate in water.
- g) Determination of Hardness of water.
- h) Determination of Residual Chlorine of water.
- i) Determination of Total Dissolved Solids.
- j) Determination of optimum coagulant dosage.
- k) Microbiological culture analysis of bacterial samples
- l) MPN Test

#### 2. Analysis of Waste Water Characteristics

- a) Determination of Total Solids, Settleable Solids, Dissolved Solids, Suspended Solids and Volatile Solids.
- b) Determination of Dissolved Oxygen, COD and BOD.
- c) Determination of Ammonia-nitrogen and Nitrates.

### Digital Learning Resources:

Course Name	Environmental Engineering I
Course Link	<a href="https://ee1-nitk.vlabs.ac.in/">https://ee1-nitk.vlabs.ac.in/</a>
Course Instructor	NIT Suratkal,

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## GEOTECHNICAL ENGINEERING-1 LAB

1. Determination of specific gravity of soil grains
2. Determination of grain size distribution of soil  
(a) Sieve test (b) Hydrometer/ pipette test
3. Determination of Atterberg limits of soil  
Liquid limit (b) plastic limit (c) shrinkage limit
4. Measurement of soil compaction in the field  
Core cutter method (b) Sand replacement method
5. Determination of Density – Water content relationship of soil.  
Proctor compaction test (ii) Modified Proctor compaction test (c) Use of Proctor penetration needle
6. Determination of relative density of granular soil
7. Determination of shear strength parameters of soil  
(a) Shear Box test (b) Tri-axial compression test (c) Unconfined compression test (d) Vane shear test
8. Determination of consolidation characteristics of soil using fixed ring Oedometer
9. Determination of California Bearing Ratio (CBR) of soaked and un-soaked soil specimens
10. Determination of coefficient of permeability of soil  
(a) Constant head permeameter (b) Falling head permeameter

### Digital Learning Resources:

Course Name	Soil Mechanics Lab
Course Link	<a href="http://smfe-iiith.vlabs.ac.in/">http://smfe-iiith.vlabs.ac.in/</a>
Course Instructor	IIIT Hyderabad

  
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