



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)
Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



Syllabus

4th semester

Batch: 2022-2026

Department of Civil Engineering

NIST Institute of Science and Technology (Autonomous)
Institute Park, Palur Hills, Berhampur, Ganjam -761008



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)
Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



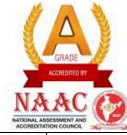
Programme Structure: B. Tech					
Fourth Semester					
Theory					
Sl. No.	Category	Subject Code	Subject Name	L-T-P	Credit
1	HSMC	22CM4HS01T	Organizational Behavior	3-0-0	3
		22CM4HS02T	Engineering Economics and Costing		
2	ESC	22CE4ES01T	Fluid Mechanics and Hydraulic Machines	3-0-0	3
3	PCC	22CE4PC01T	Structural Analysis	3-0-0	3
4	PCC	22CE4PC02T	Geotechnical Engineering	3-0-0	3
5	PCC	22CE4PC03T	Transportation Engineering	3-0-0	3
6	PEC	22CE4PE01T	Concrete Technology	3-0-0	3
		22CE4PE02T	Advanced Surveying		
		22CE4PE03T	Geographic Information System		
		22CE4PE04T	Construction Practice		
Total Credit (Theory)					18
Practical					
1	ESC	22CE4ES01L	Fluid Mechanics and Hydraulic Machines Laboratory	0-0-2	1
2	PCC	22CE4PC01L	Structural Analysis Laboratory	0-0-2	1
3	PCC	22CE4PC02L	Geotechnical Engineering Laboratory	0-0-2	1
4	PCC	22CE4PC03L	Transportation Engineering Laboratory	0-0-2	1
Total Credit (Practical)					4
Total Semester Credit					22



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

**Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008**



4th Semester	Subject Code: 22CM4HS01T	Subject Name: Organisational Behavior	L3-T0-P0	Credit: 3
------------------------------------	-------------------------------------	--	-----------------	------------------

Course Objectives:

Developing an understanding of the behaviour of individuals and groups inside organizations by enhancing the skills in appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations is the goal of any organisation. Through this course students will develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Module-I: Fundamentals of OB: (6 Hours)

Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Models of OB. Learning; Theories and their applications

Module II: Foundations of Individual Behavior: (12 Hours)

Personality and values: Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications. Attitude; ABC Model. Perception: Meaning and concept of perception, Factors influencing perception, Selective perception, Perceptual errors.

Motivation: Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow’s Need Hierarchy & Herzberg’s Two Factor Model Theory), The Process Theories (Vroom’s expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.

Module- III: Foundations of Group Behavior: (8 Hours)

Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. Developing Work Teams, Team Effectiveness & Team Building.

Leadership: Concept, Types & Styles of Leadership, Traditional & Contemporary theories of leadership Success stories of today’s Global and Indian leaders.

Module- IV: Foundations of Organisational Behavior: (10 Hours)

Organisational Culture; creating and maintenance. Organisational Change; concept and technique and theories of change. Organisational Development; concept and methods of doing development.

Course Outcomes:

Students will understand the essential of maintaining the inter-personal relationships in organisations. Personality factors will be effectively used to understand the communication among groups. The reasons for conflict will be known and prescriptive methods can be devised to enhance higher productivity in organizations. Being an employee in an organisation the importance of organisational change and culture can be known to all.

Textbook:

1. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.

Reference Books:

B. Tech: Civil Engineering



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)
Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



1. Organizational Behaviour, K. Awathappa, HPH.
2. Organizational Behaviour, VSP Rao, Excel
3. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
4. Organizational Behaviour, Hitt, Miller, Colella, Wiley
5. Organizational Behaviour, Suba Rao, Mishra, Himalaya
6. Organisational Behaviour – Uma Sekharan
7. Understanding Organizational Behaviour, Parek, Oxford



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



4th Semester	Subject Code: 22CM4HS02T	Subject Name: Engineering Economics and Costing	L3-T0-P0	Credit: 3
------------------------------------	-------------------------------------	--	-----------------	------------------

Module-I: (8 Hrs.)

Introduction to Economics: Definition, scope and nature of economics, consumption laws, demand & supply analysis, elasticity of demand & supply, indifference curve analysis.

Module-II: (10 Hrs.)

Production: factors of production, production function, law of variable proportion, laws of return to scale, elasticity of factor-substitution, optimal combination of factor-inputs, production efficiency, economies of scales, Cost of Production: types of costs, economic costs: fixed cost and variable costs, short-run and long-run cost functions.

Module-III: (10 Hrs.)

Market Structure: pure competition, perfect competition, imperfect market, monopoly and oligopoly. Indian Banking System, Functions and Roles of Commercial Banks and Reserve Bank of India.

Module-IV: (12 Hrs.)

Time value of money and interest formulae, Nominal and effective rate of interest, Present, Annual and Future worth analysis, Rate of Return Analysis, Cost-Benefit analysis in Public sector projects.

Module- V: (as per choice of faculty) (8 Hrs.)

Portion covered can be tested through Internal evaluation only not to be included in university examination.

Reference Books:

1. Koutsoyiannis, A., 'Modern Microeconomics', English Language Book Society, Macmillan.
2. Pindyck, R S, Rubinfeld, D L & Mehta, 'Microeconomics', 6 th Edition, Pearson Education India.
3. Varian, H R, 'Intermediate Microeconomics', 7th edition, East West Press India.
4. Samuelson, Paul A, 'Economics', 5th edition, McGraw Hill New York.
5. Basics of Engineering Economy; Leland Blank and Anthony Tarquin, TMH
6. Contemporary Engineering Economics, Chan. S Park, Pearson
7. Engineering Economics, Paneerselvam, PHI
8. Engineering Economics; Sasmita Mishra, P



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



4th Semester	Subject Code: 22CE4ES01T	Subject Name: Fluid Mechanics	L3-T0-P0	Credit: 3
------------------------------------	-------------------------------------	--	-----------------	------------------

Course Objectives

1. Compute pressure through manometer and design and develop marine systems with the usage of hydrostatic forces and buoyancy.
2. Differentiate velocity, acceleration, rotation and deformation etc. of fluid particles.
3. Establish Euler's theorem and deduce Bernoulli's equation for a ideal fluid and real fluids.
4. Examine and evaluate energy losses in fluid transmission trough pipes and open channel flow.

Module: I (8 hrs)

Introduction: Scope of fluid mechanics and its development as a science, physical property of fluid, density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, fluid classification.

Fluid statics: Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer.

Module: II (8 hrs)

Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface. Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

Module: III (8 hrs)

Fluid kinematics: introduction, description of fluid flow, classification of fluid flow. Reynold's number, acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity, mathematical definitions of irrotational and rotational motion. circulation, potential function, stream function, flow net

Module: IV (6 hrs)

Fluid dynamics: Introduction to N-S equation, Euler's equation along a streamline, energy equation, Bernoulli's equation, and its application to siphon, venturimeter, orifice meter, pitot tube. **Flow in pipes and ducts:** Loss due to friction, minor energy losses in pipes hydraulic gradient line (HGL), total energy line (TEL), power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel, flow through nozzles. Time required to empty the reservoir.

Module: V (8 hrs)

Open channel flow: Classification, Chezy's formula, Manning's formula, Flow through Orifice, Types of Orifices, Mouthpiece and its classification, Weirs and Notches, Discharge through weirs and notches

Course Outcomes

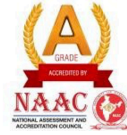
1. Apply conservation laws to fluid flow problems in engineering applications.
2. Design and compute flow kinematics of the fluid.
3. Apply the concept of dynamics of flow.
4. Analyze the free surface and pipe flows for design hydraulic structures.



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

**Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008**



Text Books:

1. A. K. Jain "*Fluid Mechanics including Hydraulic Machines*". Big Book edition, Khanna Publishers, 1998, India
2. P. N. Modi and S. M. Seth "*Hydraulics and Fluid Mechanics Including Hydraulic Machines*" 22nd Edition, Standard Book House, 2019, India

Reference Books:

1. S.K. Som and G. Biswas "*Introduction to Fluid Mechanics and Fluid Machines*", Third Edition, -Hill Higher Education, 2017, New York, United States
2. Y. A Cengel and J. M. Simbala "*Fluid Mechanics*", McGraw-Hill Higher Education, New York, United States.
3. C. S. P Ojha, P.N. Chandramouli, and R. Berndtsson "*Fluid Mechanics and Machinery*", First Edition, Oxford University Press. 2010, Oxford, United Kingdom.
4. V T Chow Open channel flow

Digital Learning Resources

Course Name	Fluid Mechanics
Course Link	https://nptel.ac.in/courses/105/103/105103192/
Course Instructor	Dr. Subhashisa Dutta , Department of Civil Engineering, IIT Guwahati

Course Name	Principle of Hydraulic Machines and System Design
Course Link	https://nptel.ac.in/courses/112/103/112103249/
Course Instructor	Prof. Pranab K. Mondal, Department of Civil Engineering, IIT Guwahati



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)
Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



4th Semester	Subject Code: 22CE4ES01L	Subject Name: Fluid Mechanics Laboratory	L0-T0-P2	Credit: 1
------------------------------------	-------------------------------------	---	-----------------	------------------

List of Experiments

1. Determination of Metacentric Height and application to stability of floating bodies.
2. Calibration of a venturimeter.
3. Calibration of an orifice.
4. Calibration of orifice meter.
5. Calibration of V-notch.
6. Flow through rectangular notch.
7. Experiments on impact of Jets
8. Classification of flows using Reynolds apparatus
9. Verifications of Stokes Law
10. Determination of Manning's roughness coefficient of a channel.



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



4th Semester	Subject Code: 22CE4PC01T	Subject Name: Structural Analysis	L3-T0-P0	Credit: 3
------------------------------------	-------------------------------------	--	-----------------	------------------

Course Objectives

1. To understand the concept of determinate and indeterminate structures.
2. To know the different methods available for the analysis of structures.
3. To know about the concept of strain energy.
4. To determine deflection of simple truss.
5. To study behaviour of arches and suspension cables and stiffening girders and analysis.

Module: I (8 hrs)

Concept of determinate and indeterminate structures, determination of degree of static and kinematic indeterminacy in beams, plane frame and continuous structures analysis of beams by Conjugate beam method and theorem of three moments and its applications in the design of structures.

Module: II (8 hrs)

Energy theorems and its application, Strain energy method, Maxwell's laws, Castigliano's theorem

Module: III (8 hrs)

Analysis of determinate plane trusses.

Module: IV (8 hrs)

Analysis of continuous beams and plane frames by slope deflection method and moment distribution method.

Module: V (8 hrs)

Analysis of three hinged arch, Suspension cable with three hinged stiffening girders subjected to dead and live loads

Course Outcomes

1. Formulate Equilibrium and compatibility equations for structural members.
2. Analyses indeterminate structures like fixed and continuous beams of simple structures.
3. Analyses the structures by energy methods.
4. Analyses the truss by energy methods.
5. Analyses arches and suspension cables and stiffening girders

Text Books:

1. C. S. Reddy, "*Basic Structural Analysis*", Third Edition, New York, United States.
2. S. S. Bhavikatti, "*Structural Analysis I & II*", First Edition, Vikas Publishing House Pvt. Ltd., 201, Noida, Delhi.



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)
Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



Reference Books:

1. J. B. Wilbur, C. H. Norris “*Elementary Structural Analysis*”, First Edition, McGraw-Hill Book Company, 1948, New York, USA.
2. A. Kassimali, “*Structural Analysis*”, Fifth Edition, Cengage Learning, 2014, India.

Digital Learning Resources

Course Name	Geo-Environmental Engineering
Course Link	https://nptel.ac.in/courses/105/105/105105166/
Course Instructor	Prof. Amit Shaw, Department of Civil Engineering, IIT Kharagpur



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

**Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008**



4th Semester	Subject Code: 22CE4PC01L	Subject Name: Structural Analysis Laboratory	L0-T0-P2	Credit: 1
------------------------------------	-------------------------------------	---	-----------------	------------------

List of Experiments

1. Experiment on deflection of simply supported beam.
2. Experiment on deflection of overhanging beam.
3. Find the value of flexural rigidity (EI) for a given beam and compare it with theoretical value.
4. Verify Maxwell's reciprocal theorem.
5. Experiment on trusses to calculate the force in the member of a simple truss.
6. Determine the deflection of a beam by moment area method.
7. Determine the deflection of a pin connected determinate truss analytically & graphically.
8. Determine SF, BM and deflection of structural elements using STAAD pro.
9. Study the behaviour of a portal frame under different end conditions.
10. Design of frame structure with different loading using STAAD pro.



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



4th Semester	Subject Code: 22CE4PC02T	Subject Name: Geotechnical Engineering	L3-T0-P0	Credit: 3
------------------------------------	-------------------------------------	---	-----------------	------------------

Course Objectives

1. To learn the basic properties of soil.
2. To understand the stress concept, permeability, and seepage properties of soil mass.
3. To determine the consolidation characteristics of soil.
4. Determination of strength characteristics of soil.
5. Find out the vertical stress in soil below the loaded area.
6. Determine in-situ properties of soil by field investigations.

Module: I (8 hrs)

Basic Characteristics of soils: Origin of soil, nature of soils, rock cycle, plasticity of fine-grained soils, particle size analysis, soil description, soil structure, and classification, phase relationships, properties of soils, activity of soil, Sensitivity and thixotropy of clay.

Module: II (8 hrs)

Seepage: Soil water, permeability and testing, seepage theory, flow nets, anisotropic soil conditions, non-homogeneous soil conditions, transfer condition, seepage through embankment dams, critical hydraulic gradient, and quicksand condition. Numerical solution using finite difference method (FDM).

Effective Stress: Introduction, principles of effective stress, response of effective stress to a change in total stress, effective stress in partially saturated soils, influence of seepage on effective stress, liquefaction. Numerical solution using the FDM.

Module: III (8 hrs)

Soil Compaction: Proctor test, factors affecting compaction, effect of compaction on soil properties, field compaction techniques.

Consolidation: Introduction, oedometer test, consolidation test, degree of consolidation, Terzaghi's theory of one-dimensional consolidation, coefficient of consolidation, secondary consolidation, correction for construction period, vertical drains, and pre-loading. Numerical solution using the FDM.

Module: IV (10 hrs)

Soil Behaviour in Shear: Introduction, stress at a point, Mohr circle of stress, mechanism of shear resistance, Mohr-Coulomb failure criterion, measurement of shear strength, shear strength of clay soils, shear strength of sands, drainage condition and strength parameters. Stress paths, pore pressure parameters, elastic properties of soil.

Vertical stress: Introduction, Boussinesq equations, vertical stress distribution diagrams, vertical stress beneath the loaded areas, Newmarks's influence chart, approximate stress distribution methods for loaded areas, Westergaard's Equation.

Module: V (6 hrs)

Ground Investigation and In-situ Testing: Introduction, methods of intrusive investigation, sampling, selection of laboratory test methods, borehole logs, standard penetration test (SPT), cone penetration test (CPT), pressure meter test (PMT), field vane



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

**Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008**



test (FVT), geophysical methods, selection of in-situ methods.

Course Outcomes

1. To determine the engineering properties of soil and classify the soils.
2. Determine the stress, permeability, and seepage characteristics of soil.
3. To identify the consolidation settlement in soils and shear strength parameters of soil.
4. To determine stress in soil below the loaded area.
5. Determine the soil properties by field investigations.

Text Books:

1. B. M. Das, *Principles of Geotechnical Engineering*, First Edition, Thompson Learning, 2002, Boston, Massachusetts, United States.
2. R. F. Craig and J. A. Knappett, *Craig's Soil Mechanics*, Eighth Edition, CRC Press, 2017, London, New York.
3. G. Ranjan and A. S. R. Rao, *Basic and Applied Soil Mechanics*, Second Edition, New Age International, 2007, New Delhi.

Reference Books:

4. S. K. Gulhati and M. Datta, *Geotechnical Engineering*, First Edition, McGraw Hill Education, 2017, New York, United States.
5. V. N. S. Murthy, *Principles of Soil Mechanics and Foundation Engineering*, First Edition, UBS Publishers and Distributors, 2002. New Delhi.

Digital Learning Resources

Course Name	Geotechnical Engineering - I
Course Link	https://nptel.ac.in/courses/105/101/105101201/
Course Instructor	Prof. Devendra Narain Singh, Department of Civil Engineering, IIT Bombay



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

**Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008**



4th Semester	Subject Code: 22CE4PC02L	Subject Name: Geotechnical Engineering Laboratory	L0-T0-P2	Credit: 1
------------------------------------	-------------------------------------	--	-----------------	------------------

List of Experiments

1. Determination of specific gravity of soil.
2. Determination of grain size distribution of soil (a) Sieve analysis (b) Hydrometer analysis.
3. Determination of Atterberg limits of soil (a) Liquid limit (b) plastic limit (c) shrinkage limit.
4. Measurement of field density by using (a) Core cutter method (b) Sand replacement method.
5. Determination of Density – Water content relationship of soil by standard Proctor test (ii) Modified Proctor 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.



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



4th Semester	Subject Code: 22CE4PC03T	Subject Name: Transportation Engineering	L3-T0-P0	Credit: 3
------------------------------------	-------------------------------------	---	-----------------	------------------

Course Objectives

1. To explain about highway transportation system.
2. To design the geometric features of highway.
3. To know the fundamentals of traffic engineering.
4. To study about the properties of pavement material and maintenance of pavement.
5. To study about construction procedure of various layers of pavement.

Module: I (8 hrs)

Introduction: Importance of transportation, modes of transportation, characteristics of road transport, importance of roads in India, current road development in India, scope of highway engineering, development of road construction. Highway planning: objective, classification, road patterns, road development plans, highway alignments requirements, factors controlling alignment, engineering surveys for highway alignment.

Module: II (8 hrs)

Geometric design: Importance of geometric design, design controls and criteria, highway cross section elements, cross slope or camber, width of pavement, road margins, typical cross sections of roads, design speed, stopping sight distance, PIEV theory, overtaking sight distance, design of horizontal and vertical alignments, horizontal and vertical curves.

Module: III (8 hrs)

Traffic Engineering: Traffic studies on flow and speed, peak hour factor, accident study, statistical analysis of traffic data; Microscopic and macroscopic parameters of traffic flow, fundamental relationships; Traffic signs; Signal design by Webster's method; Types of intersections; Highway capacity.

Module: IV (8 hrs)

Highway Pavements: highway materials, desirable properties and tests, desirable properties of bituminous paving mixes, design factors for flexible and rigid pavements, joints in rigid pavements, design of flexible and rigid pavement using IRC codes.

Module: V (8 hrs)

Highway construction: construction of various layers, earthwork, WBM, GSB, WMM, various types of bituminous layers, construction of rigid pavements, hot mix plants, highway construction equipment. Highway maintenance: various type of failures and remedial measures for flexible and rigid pavements. Highway drainage and roadside plantation.

Course Outcomes

1. To apply the fundamentals of highway transportation system.
2. To design the different geometric elements of cross section of roads.
3. To apply the concept of traffic studies for highway design.
4. To apply the knowledge of pavement materials and maintenance in highways.



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)
Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



5. To design different layers of flexible and rigid pavements.

Text Books:

1. S. K. Khanna and C. E. G. Justo, *Highway Engineering*, Tenth Edition, Nem Chand & Bros, Roorkee, Uttarakhand (INDIA)
2. L. R. Kadiyali, N. B. Lal, *Principles and Practices of Highway Engineering*, First Edition, Khanna Publishers, 2005, Delhi, India.

Reference Books:

1. C. Venkatramaiah, *Transportation Engineering*, Universities Press (India) Pvt. Ltd., 2016, Hyderabad, India.

Digital Learning Resources

Course Name	Transportation Engineering I
Course Link	https://nptel.ac.in/courses/105/101/105101087/
Course Instructor	Dr. Tom V Mathew, Department of Civil Engineering, IIT Bombay



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela

INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



4th Semester	Subject Code: 22CE4PC03L	Subject Name: Transportation Engineering Laboratory	L0-T0-P2	Credit: 1
------------------------------------	-------------------------------------	--	-----------------	------------------

List of Experiments

1. Determination of aggregate crushing value.
2. Determination of Los Angeles abrasion value of aggregates.
3. Determination of aggregate impact value.
4. Determination of flakiness index and elongation index of coarse aggregate
5. Determination of specific gravity and water absorption of coarse aggregate.
6. Determination of viscosity and penetration test of bitumen.
7. Determination of softening point value of bitumen.
8. Determination of ductility value of bitumen.
9. Determination of flash and fire point of bitumen.
10. Field demonstration of an ongoing highway project with respect to geometric, material and traffic parameters.



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



4th Semester	Subject Code: 22CE4PE01T	Subject Name: Concrete Technology	L3-T0-P0	Credit: 3
------------------------------------	-------------------------------------	--	-----------------	------------------

Course Objectives

1. To know different properties of cement and aggregate.
2. To explain the workability of concrete.
3. To design the mix design procedure for different types of concrete.
4. To study about the properties of concrete
5. To apply the use special concretes in industry.

Module: I (8 hrs)

Constituent Materials: cement, different types, chemical composition and properties, hydration of cement, tests on cement. **Aggregates:** classification, mechanical properties, and tests, grading requirements, water: quality of water for use in concrete.

Module: II (8 hrs)

Chemical And Mineral Admixtures: accelerators, retarders, plasticizers, super plasticizers, water proofers, mineral admixtures like fly ash, silica fume, ground granulated blast furnace slag and metakaolin, effects on concrete properties.

Module: III (8 hrs)

Proportioning of Concrete Mix: principles of mix proportioning, properties of concrete related to mix design, physical properties of materials required for mix design, design mix and nominal mix, bis method of mix design, mix design examples.

Module: IV (8 hrs)

Fresh and Hardened Properties of Concrete: workability, tests for workability of concrete , segregation and bleeding, determination of strength properties of hardened concrete, compressive strength, split tensile strength, flexural strength, stress-strain curve for concrete, modulus of elasticity, durability of concrete, water absorption, permeability.

Module: V (8 hrs)

Special Concretes: light weight concretes, foam concrete, self-compacting concrete, vacuum concrete, high strength concrete, fiber reinforced concrete, ferrocement, ready mix concrete, polymer concrete, high performance concrete, geopolymer concrete. Field automation in RMC plant.

Course Outcomes

Able to know the

1. To apply the basic materials for making concrete.
2. To Apply effect of admixtures on properties of concrete.
3. To analyze concept of mix design as per IS method.
4. To explain the properties of concrete at fresh and hardened state.
5. To apply the special concretes in industry.



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)
Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



Textbooks:

1. M.L. Gambhir, “*Concrete Technology*”, Third Edition, Tata McGraw Hill Publishing CoLtd, 2007, New Delhi, India.
2. S. S. Bhavikatti, “*Concrete Technology*”, Tenth Edition, .K.International Publishing HousePvt. Ltd., 2015, New Delhi, India.

Reference Books:

1. M. S. Shetty, “*Concrete Technology*”, S.Chand and Company Ltd, 2003, New Delhi, India.
2. A. R. Santhakumar “*Concrete Technology*”, Oxford University Press India, 2006, UttarPradesh, India

Digital Learning Resources

Course Name	Concrete Technology
Course Link	https://nptel.ac.in/courses/105/102/105102012/
Course Instructor	Dr. B. Bhattacharjee, Department of Civil Engineering, IIT Delhi



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



4th Semester	Subject Code: 22CE4PE02T	Subject Name: Advanced Surveying	L3-T0-P0	Credit: 3
------------------------------------	-------------------------------------	---	-----------------	------------------

Course Objectives

1. To explain about the Tacheometric Surveying
2. To know the area of traverse by using aerial photogrammetry
3. To study the process of laying out plan using Total station instrument
4. To understand the use of GPS survey and data processing.
5. To study the reconnaissance survey for highways, railways and waterways

Module: I (8 hrs)

Tacheometry: introduction, principle of tacheometric surveying, uses of tacheometry, types of instruments used in tacheometric surveying, methods in the tacheometric surveying, stadia method, fixed-hair method, determination of tacheometric constants, analectic lens, advantages and disadvantages, errors in stadia surveying, subtense bar instrument.

Module: II (8 hrs)

Aerial Surveying: Terrestrial photogrammetry, terrestrial stereo photogrammetry, aerial photogrammetry, overlaps, scale of photographs, vertical and titled photographs distortion in aerial photographs, stereoscopic vision, photo interpretation, applications.

Module: III (8 hrs)

Total Station surveying: advantages and disadvantages of total station, measuring angles, types of total station, advancement in total station technology, automatic target recognition (atr), introduction to EDM, measurement principle of EDM instrument, EDM instrument characteristics, classification of EDM, errors in electronic distance measurement.

Module: IV (8 hrs)

GPS Surveying: Basic concepts, space, control and user segments, satellite configuration, signal structure, orbit determination and representation, ant spoofing and selective availability, handheld and geodetic receivers, field work procedure, data processing applications.

Module: V (8 hrs)

Reconnaissance survey: route surveys for highways, railways, and waterways, simple, compound, reverse, transition, and vertical curve, setting out methods, hydrographic surveying, tides, msl, sounding methods, measurement of current and discharge, tunnel alignment and setting out, settlement and deformation studies.

Course Outcomes

On completion of this course, the student shall be able to

1. To apply the concept of tacheometric surveying.
2. To analyze the photogrammetric surveying and interpretation.
3. To solve the field problems with Total station.
4. To know the GPS surveying and the data processing.
5. To design the route surveys and tunnel alignments.



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)
Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



Text Books:

1. S. K. Duggal, “*Surveying*”, Fourth Edition, TMH Education Pvt. Ltd, 2013, New Delhi, India.
2. B. Bhatta, “*Remote Sensing and GIS*”, Second Edition, Oxford University Press India, 2011, Uttar Pradesh, India.

Reference Books:

1. S. Gopi, R. S. Kumar and N. Madhu, “*Advanced Surveying, Total station, GIS & Remotesensing*”, First Edition, Pearson Education, 2006, New Delhi, India

Digital Learning Resources

Course Name	Higher Surveying
Course Link	https://nptel.ac.in/courses/105/103/105103176/
Course Instructor	Prof. Ajay Dashora, Department of Civil Engineering, IIT Guwahati



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



4th Semester	Subject Code: 22CE4PE03T	Subject Name: Geographical Information System	L3-T0-P0	Credit: 3
------------------------------------	-------------------------------------	--	-----------------	------------------

Course Objective

1. To introduce the fundamentals and components of geographic information system
2. To study about the history and components of GIS To study about data types and operations.
3. To know about the principles of remote sensing and spectral signatures.
4. To provide details of spatial data structures and input, management, and output processes.
5. To know the applications of remote sensing and GIS.

Module: I (8 hrs)

Geographic Information system: Introduction to GIS, components of a GIS, geo spatial data: Spatial data- attribute data-joining spatial and attribute data; GIS operations: spatial data input – attribute data management, data display data exploration, data analysis. GIS Spatial Analysis: computational analysis methods (CAM), visual analysis methods (VAM), data storage, vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

Module: II (8 hrs)

Data collection and input overview: data input and output. keyboard entry and coordinate geometry procedure, manual digitizing and scanning, raster GIS, vector GIS, file management, spatial data, layer-based GIS, feature based GIS mapping.

Module: III (8 hrs)

Remote Sensing: Basic concept of remote sensing, data and information, remote sensing data collection, remote sensing advantages & limitations, remote sensing process, electromagnetic spectrum, energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian satellites and sensors characteristics, resolution, map and image and false color composite, introduction to digital data, elements of visual interpretation techniques.

Module: IV (8 hrs)

Data Management and Output: Import/export, data management functions, raster to vector and vector to raster conversion, data output, map compilation, chart/graphs, multimedia, enterprise vs. desktop GIS, distributed GIS.

Module: V (8 hrs)

Applications of GIS: Land use/land cover in water resources, surface water mapping and inventory, rainfall runoff relations and runoff potential in dices of watersheds, flood and drought impact assessment and monitoring, watershed management for sustainable development, watershed characteristics

Course Outcomes



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

**Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008**



On completion of this course, the student shall be able to

1. Have basic idea about the fundamentals of GIS.
2. To understand the types of data models, data input and topology.
3. To gain knowledge on data quality and standards.
4. To understand data management functions and data output
5. To apply GIS in land use, disaster management and resource information system

Text Books:

1. Kang - Tsung Chang, "Introduction to Geographic Information Systems", Second Edition, McGraw Hill Publishing, 2011.
2. B. Bhatta, "Remote Sensing and GIS", Second Edition, Oxford University Press India, 2011, Uttar Pradesh, India.

Reference Books:

1. C.P.Lo Albert, K.W. Yonng, "Concepts & Techniques of GIS", Prentice Hall (India) Publications.
2. I. Heywood, S. Cornelius, S. Carver, S. Raju, "An Introduction Geographical Information Systems", Second Edition, Pearson Education, 2007.
3. LRA Narayana, "Remote Sensing and its applications", University Press, 1999.

Digital Learning Resources

Course Name	Introduction to Geographical Information Systems
Course Link	https://nptel.ac.in/courses/105/107/105107155/
Course Instructor	Dr. Arun K Saraf, Department of Earth Science , IIT Roorkee

Course Name	Geographical Information Systems
Course Link	https://nptel.ac.in/courses/105/107/105107206/
Course Instructor	Dr. Arun K Saraf, Department of Earth Science , IIT Roorkee

Course Name	Geographical Information Systems
Course Link	https://nptel.ac.in/courses/107/105/107105088/
Course Instructor	Dr. Bharat H Aithal, IIT Khargpur



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)

Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



4 th Semester	Subject Code: 22CE4PE03T	Subject Name: Construction Practice	L3-T0-P0	Credit: 3
-----------------------------	-----------------------------	--	----------	-----------

Course Objectives

1. To compare the properties of most common civil Engineering materials.
2. To know the production of concrete and the method of placing and making of concrete elements.
3. To apply the different construction techniques and structural systems
4. To apply the various techniques and practices on masonry construction.
5. To know the maintenance and repair of buildings.

Module: I (8 hrs)

Construction materials: stone; stone as building material, criteria for selection, tests on stones, **Bricks:** classification, tests on bricks, compressive strength, water absorption, efflorescence, bricks for special use, refractory bricks, concrete blocks. **Fine aggregates:** river sand, crushed stone sand, properties. **Coarse aggregates:** crushing strength, impact strength, flakiness index, elongation index, abrasion resistance, grading.

Module: II (8 hrs)

Cement: ingredients, manufacturing process, types and grades, properties of cement and cement mortar, hydration, compressive strength, tensile strength, fineness, soundness, consistency, setting time. **Concrete:** ingredients, manufacturing process, batching plants, mixing, transporting, placing, compaction of concrete, curing and finishing, ready mix concrete, mix specification.

Module: III (8 hrs)

Construction practices: specifications, details and sequence of activities and construction co-ordination, site clearance, marking, earthwork, masonry, bond in masonry. **Foundation:** types of foundation

Module: IV (8 hrs)

Brick Masonry: Types of bonds, brick lying, joints in brickwork, reinforced brickwork, joint between old and new masonry, maintenance of brick work. **Stone Masonry:** types of stone masonry, rubble and ashlar, general principles of construction, joints of stone, maintenance of stonework.

Module: V (8 hrs)

Damp Proofing: causes and effects, materials used for damp proofing, methods of preventing dampness, damp proof course. **Plastering:** definition, materials used for plastering, types of plastering, methods of plastering, defects, and remedial measures in plastering. **Maintenance of Buildings** causes and prevention of cracks in building, leakage of buildings, special repair of buildings, annual maintenance.



www.nist.edu

NIST INSTITUTE OF SCIENCE AND TECHNOLOGY (Autonomous)
Approved by AICTE, New Delhi, Affiliated to BPUT: Rourkela
INSTITUTE PARK, PALLUR HILLS, BERHAMPUR, ODISHA - 761008



Course Outcomes

On completion of this course, the student shall be able to

1. Compare the properties of most common civil engineering materials.
2. Know the production of concrete and the method of placing and making of concrete elements.
3. know the different construction techniques and structural systems.
4. Understand various techniques and practices on masonry construction.
5. Able to maintain and repair of buildings.

Text Books:

1. S. Kumar “Building Materials and construction”, 20th edition, Standard Publishers, 2015.
2. B. C. Punmia, A. K. Jain, A. K. Jain, “Building Construction”, Laxmi Publications Pvt.ltd., New Delhi

Reference Books:

Digital Learning Resource