

Board of Studies (Civil Engineering Department)

13th Meeting
(30th May, 2020)

Civil Engineering Department

Guru Nanak Dev Engineering College, Gill Park

Ludhiana—141006

Agenda Items

1. Under Graduate Program

a) For Batch 2018 & Onwards

- i) The study scheme was finalized in previous 10th BOS meeting held in the HoD office (Civil) on 09 February 2019. The department proposes syllabus for 5th semester for this study scheme.

Subjected for Discussion & Approval

- ii) Department invites discussion on inclusion of 6 months industrial training in current or for new scheme.

Subjected for Discussion & Approval

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus

B.Tech (Civil Engineering)
2018 Admission Batch Onwards
Subject Code: PCCE-109
Subject Name: Engineering Geology

Programme: B.Tech (Civil Engineering)	L: 3 T: 0 P: 0
Semester: 5	Teaching Hours: 45 Hours
Theory/Practical: Theory	Credits: 03
Internal Marks: 40	Percentage of Numerical/Design Problems: 0%
External Marks: 60	Duration of End Semester Exam(ESE): 3 hours
Total Marks: 100	Elective Status: Compulsory

Additional Material Allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO	Course Outcomes
1.	Understand the geological considerations in civil engineering projects.
2.	Predict the different properties of rocks.
3.	Identify the geological problems associated with civil engineering structures and suggest remedies.
4.	Analyze geological data for civil engineering projects.
5.	Inter predict the engineering properties of rocks in laboratory and field
6.	Plan appropriate techniques for improvement the engineering properties of rocks.

Detailed Contents:

Part-A

Introduction:

6 hours

Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Department dealing with this subject in India and their scope of work Mineralogy-Mineral, Origin and composition. Physical properties of minerals. Rock forming minerals, megascopic identification of common primary & secondary minerals.

Petrology:

8

hours

Rock forming processes. Specific gravity of rocks. Ternary diagram. Igneous petrology- Volcanic Phenomenon and different materials ejected by volcanoes. Types of volcanic eruption. Concept of Hot spring and Geysers. Characteristics of different types of magma. Division of rock on the basis of depth of formation, and their characteristics. Chemical and Mineralogical Composition. Texture and its types. Various forms of rocks. Classification of Igneous rocks on the basis of Chemical composition. Detailed study of Acidic Igneous rocks like Granite. Engineering aspect to granite. Basic Igneous rocks Like Gabbro, Dolerite, Basalt. Engineering aspect to Basalt. Sedimentary petrology- mode of formation, Mineralogical Composition. Texture and its types, Structures, Gradation of Clastic rocks. Classification

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus

B.Tech (Civil Engineering)
2018 Admission Batch Onwards

of sedimentary rocks and their characteristics. Detailed study of Conglomerate, Breccia, Sandstone, Mudstone and Shale, Limestone Metamorphic petrology- Agents and types of metamorphism, metamorphic grades, Mineralogical composition, structures & textures in metamorphic rocks. Important Distinguishing features of rocks as Rock cleavage, Schistosity, Foliation. Classification. Detailed study of Gneiss, Schist, Slate with engineering consideration.

Physical Geology:

5 hours

Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. Superficial deposits and its geotechnical importance: Water fall and Gorges, River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landform, Loess, Solifluction deposits, mudflows, Coastal deposits.

Strength Behavior of Rocks:

6 hours

Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold- Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.

Part-B

Geological Hazards:

5 hours

Types of landslide. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Lowering of water table and Subsidence. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth.-Seismic Zone in India.

Rock masses as construction material:

5 hours

Definition of Rock masses. Main features constituting rock mass. Main features that affects the quality of rock engineering and design. Basic element and structures of rock those are relevant in civil engineering areas. Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals. Effect of alteration and weathering. Measurement of velocity of sound in rock. Classification of Rock material strength. Rock Quality Designation.

Geology of dam and reservoir site:

5 hours

Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures.

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech (Civil Engineering)
2018 Admission Batch Onwards

Rock Mechanics:

5 hours

Sub surface investigations in rocks and engineering characteristics or rocks masses; Structural geology of rocks. Classification of rocks, Field & laboratory tests on rocks, Stress deformation of rocks, Failure theories and shear strength of rocks, Bearing capacity of rocks.

Text Books:

1. Rock Mechanics for Engineers - B.P. Verma - Khanna Publishers New Delhi.
2. Engineering Geology - D.S.Arora – Mohindra Capital Publishers 2000.
3. Engineering Geology - Parbin Singh - 8th Edition S.K. Kataria & Sons.

Reference Books:

1. Introduction to Rock Mechanics - Richard E. Goodman – wiley.
2. Engg. Behaviour of rocks - Farmar, I.W - Kluwer Academic Publishers.
3. Rock Mechanics and Engg. - C Jaeger – Cambridge University Press.
4. Text Book of Engineering Geology – Kesavvalu - MacMillan India.
5. Geology for Geotechnical Engineers - J.C.Harvey - Cambridge University Press.

E-Books and online learning material:

The Elements of Geology by William Harmon Norton

<https://www.freebookcentre.net/earth-science-books-download/The-Elements-of-Geology.html>

Structural Geology by Stephen J. Martel

<https://www.freebookcentre.net/earth-science-books-download/Structural-Geology-by-Stephen-J.-Martel.html>

Geology Lecture Notes and Supplementary Material by Scott T. Marshall

<https://www.freebookcentre.net/earth-science-books-download/Geology-Lecture-Notes-and-Supplementary-Materials.html>

Physical Geology by Stephen A. Nelson

<https://www.freebookcentre.net/earth-science-books-download/Physical-Geology.html>

Online Courses and Video Lectures:

1. <https://www.youtube.com/watch?v=aTVDiRtRook&list=PLDF5162B475DD915F>
2. <https://www.youtube.com/watch?v=fvoYHzAhvVM>
3. <https://www.youtube.com/watch?v=9K2Zu-phR4Q>
4. <https://www.youtube.com/watch?v=UzZFMWH-lSQ>
5. <https://freevidelectures.com/course/87/engineering-geology>

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus

B.Tech (Civil Engineering)
2018 Admission Batch Onwards
Subject Code: PCCE-110

Subject Name: Elements of Earthquake Engineering

Programme: B.Tech. (Civil Engineering)	L: 3 T: 0 P: 0
Semester: 5	Teaching Hours: 30 Hours
Theory/Practical: Theory	Credits: 3
Internal Marks: 40	Percentage of Numerical/Design Problems: 70%
External Marks: 60	Duration of End Semester Exam (ESE): 3 Hours
Total Marks: 100	Elective Status: Compulsory

Prerequisites: Math-1

Additional Material Allowed in ESE: Non programmable calculator. But, No Indian Codes of Practice and other Design handbooks are permitted, so paper setter is expected to provide required data from relevant IS codes (IS 1893, IS 4326, IS13920) for any numerical or design part if given in the question paper.

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Learn from the past earthquakes - damages to buildings, different terminology
2.	Develop equation of motion for different 1-dof systems
3.	Predict the response of 1-dof systems under different loadings
4.	Estimate the lateral earthquake (EQ) loads for given 1-dof frames, etc.
5.	Analyse 1-dof frames and beams subjected to the lateral loadings
6.	Apply different provisions of BIS guidelines related to earthquake design of buildings

Detailed Syllabus

Part-A

Introduction to Earthquakes (EQ) and their causes; Basic Terminology - Magnitude, Intensity, Peak ground motion parameters; Past Earthquakes and Lessons learnt; Various Types of the damages caused by EQ to the Buildings [5 hours]

Introduction to the theory of Vibrations; Sources of the vibrations and its different types; Concept of Degree of Freedom (*dof*) and its application; Spring action and damping, different parameters; Equation of motion for single-*dof* systems - Undamped and Damped system and their action / response under transient forces; General solution; Green's function. [10 hours]

Part-B

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus

B.Tech (Civil Engineering)
2018 Admission Batch Onwards

Lateral Force analysis; Floor Diaphragm action and its importance in analysis; Concept of Lateral Strength, Stiffness, ductility & their importance; Different structural configurations to transfer EQ forces - Moment resisting frames & Shear walls, Concepts of seismic design. [7 hours]

Different BIS guidelines related to earthquake forces - IS 1893-2002, IS 4326, IS 13920. Their use in the estimation of lateral EQ forces for RC framed building and brick masonry buildings. [8 hours]

References:

1. Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2. Dynamics of Structures: Theory and Applications to Earthquake Engineering, AK Chopra, Prentice Hall
3. Dynamics of Structures, R.W. Clough and Joseph Penzien, McGraw-Hill Education
4. Structural Dynamics by Mario & Paz, Springer
5. Earthquake Resistant Design by David J. Dowrick, Wiley India Pvt Ltd
6. Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers
7. IS 1893-2002 Indian Standard Criteria for Earthquake Resistant Design of Structures.
8. IS 4326- 2002 Indian Standard for Earthquake Resistant Design and Construction of Buildings
9. IS 13920-2002 Ductile detailing of Reinforced Concrete Structures subjected to Seismic Forces.

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus

B.Tech (Civil Engineering)
2018 Admission Batch Onwards
Subject Code: PCCE-111

Subject Name: Construction Engineering and Management

Programme: B.Tech. (Civil Engineering)	L: 3 T: 0 P: 0
Semester: 5	Teaching Hours: 36 Hours
Theory/Practical: Theory	Credits: 3
Internal Marks: 40	Percentage of Numerical/Design Problems: 20%
External Marks: 60	Duration of End Semester Exam (ESE): 3 Hours
Total Marks: 100	Elective Status: Compulsory

Additional Material Allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Identify various construction methods with their respective features.
2.	Decide various resources required for a particular construction project.
3.	Use CPM and PERT techniques to identify the best course of action for the given input parameters.
4.	Explain different techniques and elements of monitoring a construction project.
5.	Draw a comprehensive checklist required for quality control at a construction project.
6.	Differentiate and explain type of civil engineering contracts including important features.

Detailed Contents:

Part-A

Basics of Construction

2 hr

Unique features of construction, construction projects- types and features, phases of a project, agencies involved and their methods of execution;

Construction Methods and Equipment

8 hr

Formwork and Staging, conventional walls and slabs; conventional framed structure with blockwork walls; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures. Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities.

Planning and Organizing Construction Site and Resources

8 hr

Site- site layout including enabling structures, developing site organization, documentation at site; Manpower- planning, organizing, staffing; Materials- planning, procurement, inventory control; Equipment- productivity, planning, organizing; Funds- cash flow, sources of funds; Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts; resource

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus

B.Tech (Civil Engineering)
2018 Admission Batch Onwards

aggregation, allocation, smoothening and leveling. Make-up of construction costs; Classification of costs, time- cost trade-off in construction projects, compression and decompression.

Part-B

Construction Project Planning

10 hr

Stages of project planning- pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor. Process of development of plans and schedules- work break-down structure, assessment of work content and durations, activity lists, sequence of activities. Techniques of planning- Bar charts, Gantt Charts. CPM Network- basic terminology, types of precedence relationships, activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT- Assumptions underlying PERT analysis, determining three-time estimates, analysis, slack computations, calculation of probability of completion.

Project Monitoring, Control & Safety

5 hr

Supervision, record keeping, periodic progress reports. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures, Use of Building Information Modelling (BIM) in project management; Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures.

Contracts Management Basics

3 hr

Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given), Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.

Text Books:

1. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
2. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015
3. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

Reference Books/Codes:

1. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
2. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.
3. Chudley, R., Construction Technology, ELBS Publishers, 2007.
4. National Building Code, Bureau of Indian Standards, New Delhi, 2017.

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech (Civil Engineering)
2018 Admission Batch Onwards
Subject Code: PCCE-112
Subject Name: Environmental Engineering

Programme: B.Tech (Civil Engineering)	L: 4 T: 0 P: 0
Semester: 5	Teaching Hours: 52 Hours
Theory/Practical: Theory	Credits: 4
Internal Marks: 40	Percentage of Numerical/Design Problems: 30%
External Marks: 60	Duration of End Semester Exam (ESE): 3 hours
Total Marks: 100	Elective Status: Compulsory

Prerequisites: Nil

Additional Material Allowed in ESE: Graph papers

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Identify different types of water demands and select suitable source of water.
2.	Analyze water and wastewater quality for a given end use and disposal, respectively.
3.	Design and provide an appropriate sewerage system.
4.	Examine physical and chemical composition of solid wastes and to investigate the activities associated with the management of solid waste.
5.	Define various sources of air pollution and their effects on environment.
6.	Select the most appropriate technique for the treatment of water, wastewater, solid waste and contaminated air.

Detailed Contents:

Unit 1: Water:- General requirement for water supply, population forecasting and water demand, sources, intake, pumping and transportation of water; Physical, chemical and bacteriological characteristics of water and their significance, Water quality criteria, Water borne diseases, Natural purification of water sources. Engineered systems for water treatment: aeration, sedimentation, softening, coagulation, filtration, adsorption, ion exchange, membrane processes and disinfection. **(14 hours)**

Unit 2: Wastewater:- Generation of domestic wastewater, sullage, storm water, Wastewater flow variations; Conveyance of wastewater- Sewers, shapes design parameters, Design of sewerage systems, wastewater pumping, sewer appurtenances. Wastewater collection from buildings; Physical, chemical and bacteriological characteristics of wastewater, Wastewater treatment, Primary, secondary and tertiary treatment of wastewater, wastewater disposal standards, aerobic and anaerobic treatment systems, suspended and attached growth systems, sludge digestion and handling, recycling of sewage – quality requirements for various purposes. **(20 hours)**

Unit 3: Solid Waste:- Engineering principles; Sources, Composition and Properties of Municipal Solid Waste, Onsite handling, storage and processing, Collection, transfer and transport, Recovery of resources, Conversion products and energy, Disposal of solid waste including sanitary landfill. Introduction to

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech (Civil Engineering)
2018 Admission Batch Onwards

biomedical and hazardous waste management.

(12 hours)

Unit 4: Air and Noise Pollution:- Air Pollutants, their sources, harmful effects on environment, metrology and atmospheric diffusion of pollutants, air sampling and pollutant measurement methods, ambient air quality and emission standards, control, removal of gaseous pollutants, particulate emission control, control of automobile pollution. Noise: Basic concept, measurement and various control methods. **(06 hours)**

Text/Reference Books:

1. Peavy H.S., Rowe D.R. and Tchobanoglous G. “*Environmental Engineering*”, 1st Edition, McGraw-Hill Education (Indian Edition), 2017.
2. Davis M.L and Cornwell D.A. “*Introduction to Environmental Engineering*”, 5th Edition, McGraw-Hill Education, 2012
3. Nathanson J.A. and Schneider R.A. “*Basic Environmental Technology*”, 6th Edition, Pearson Education India, 2016
4. Masters G.M. and Ela W.P. “*Introduction to Environmental Engineering and Science*” 3rd Edition, Pearson International, 2014
5. Garg S.K. “*Water Supply Engineering*”, 33rd Edition, Khanna Publishers, 2010.
6. Garg S.K., “*Sewage Disposal and Air Pollution*”, 39th Edition, Khanna Publishers, 2019.
7. MetCalf and Eddy, “*Wastewater Engineering- Treatment and Reuse*”, 4th Edition, McGraw-Hill Education (Indian Edition), 2017.
8. “*Manual on Operation and Maintenance of Water Supply System*”, Central Public Health & Environmental Engineering Organisation, Ministry of Housing and Urban Affairs, Govt. of India, 2005.
9. “*Manual on Sewerage and Sewage Treatment Systems*”, Central Public Health & Environmental Engineering Organisation, Ministry of Housing and Urban Affairs, Govt. of India, 2013.
10. “*Manual on Municipal Solid Waste Management*”, Central Public Health & Environmental Engineering Organisation, Ministry of Housing and Urban Affairs, Govt. of India., 2016.

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus

B.Tech (Civil Engineering)
2018 Admission Batch Onwards
Subject Code: PCCE-113
Subject Name: Structural Engineering

Programme: B.Tech. (Civil Engineering)	L: 3 T: 1 P: 0
Semester: 5	Teaching Hours: 40 Hours
Theory/Practical: Theory	Credits: 3
Internal Marks: 40	Percentage of Numerical/Design Problems: 70%
External Marks: 60	Duration of End Semester Exam (ESE): 3 Hours
Total Marks: 100	Elective Status: Compulsory

Prerequisites: Math-1

Additional Material Allowed in ESE: Non programmable calculator, IS 456, IS 800, IS 875

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Calculation of loads and its effects in structural members.
2.	Selection of appropriate structural type and load for a given set of constraints
3.	Analyse structural system and determination of forces and displacements
4.	Select suitable material for construction of structural system
5.	Design of different structural elements
6.	Detail different structural element as per different applicable BIS guidelines

Detailed Syllabus

Part-A

The concept of structure, what makes a structure, its need and types; Role of engineers, architects, builders and end-users in a construction project [2 hours]

First principles of planning and design process: Load, types of load and its assessment; Concept of equilibrium - Principles of structural stability & robustness; Concept and importance of load path, its selection. [6 hours]

Structural analysis: Effect of load on the structural member/system - displacements, stresses and strains, their importance and calculation for simple elemental problems; Concept of redundancy and its importance - determinate and redundant structural systems; Classical methods of analysis - beam, arch, pin- and rigid-jointed frames (only portal types to illustrate the concept). [13 hours]

Part-B

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus

B.Tech (Civil Engineering)
2018 Admission Batch Onwards

Materials - Concrete and steel, their behavior and properties; Design safety and structural design criteria; Role of standards (BIS) in the design process. [7 hours]

Design of structural elements - Slabs (4-sides supported cases on rigid-beams), Beams, Axially loaded columns, Isolated footings and Stairs; Checks to ensure completeness of a selected load path; Constructability, fire protection and durability aspects; Detailing, its importance and BIS design guidelines. [12 hours]

Text/Reference Books

Devdas Menon, Reinforced Concrete Design. McGraw Hill, 2017
Devdas Menon, Structural Analysis. Narosa, 2010
Gambhir M L, Design of Reinforced Concrete Structures. PHI, 2008
Gambhir M L, Fundamental of Structural Steel Design, McGraw Hill, 2017
Gambhir M L, Fundamental of Structural Mechanics and Analysis, PHI, 2011
Nilson, A. H. Design of Concrete Structures. 13th edition. McGraw Hill, 2004
McCormac, J.C., Nelson, J.K. Jr., Structural Steel Design. 3rd edition. Prentice Hall, N.J., 2003.
Galambos, T.V., Lin, F.J., Johnston, B.G., Basic Steel Design with LRFD, Prentice Hall, 1996
Salmon, C.G. and Johnson, J.E., Steel Structures: Design and Behavior, 3rd Edition, Harper & Row, Publishers, New York, 1990.
NBC, National Building Code, BIS (2017).

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech (Civil Engineering)
2018 Admission Batch Onwards
Subject Code: PCCE – 114
Subject Name: Geotechnical Engineering

Programme: B.Tech.	L: 3 T: 1 P: 0
Semester: 5	Teaching Hours: 43 + 15 (T)= 58 Hours
Theory/Practical: Theory	Credits: 3
Internal Marks: 40	Percentage of Numerical/Design Problems: 70%
External Marks: 60	Duration of End Semester Exam (ESE): 3hours
Total Marks: 100	Elective Status: Compulsory

Prerequisites: NIL

Additional Material Allowed in ESE: Scientific Calculator, graph (natural scale and semi-log)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Classify different types of soils based on their origin & formation, and derive various phase relationships of the soil
2.	Determination of different physical and engineering characteristics of soils
3.	Evaluate shear strength and permeability parameters of different soils
4.	Compute elastic and consolidation settlements
5.	Apply the principles of compaction to field problems
6.	Evaluate relative merits and demerits of various soil investigation techniques to understand the characteristics of subsoil for the design of foundations

Detailed Contents:

Part-A

Introduction and basic concepts

4+2T = 6hours

Types of soils, their formation and deposition, Definitions: soil mechanics, soil engineering, rock mechanics, geotechnical engineering. Scope of soil engineering. Comparison and difference between soil and rock. Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio, and porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity, etc. Relationship between volume weight, voids ratio- moisture content, unit weight- percent air voids, saturation- moisture content, moisture content- specific gravity etc. Determination of various parameters such as: Moisture content by oven dry method, pycnometer, sand bath method, torsional balance method, nuclear method, alcohol method and sensors. Specific gravity by density bottle method, pycnometer method, measuring flask method. Unit weight by water displacement method, submerged weight method, core-cutter method, sand-replacement method.

Plasticity Characteristics of Soil

6+2T = 8hours

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus

B.Tech (Civil Engineering)
2018 Admission Batch Onwards

Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, definitions of activity and sensitivity. Determination of: liquid limit, plastic limit and shrinkage limit. Use of consistency limits. Classification of Soils-Introduction of soil classification: Indian standard soil classification system. Identification: field identification of soils, general characteristics of soil in different groups.

Permeability and seepage of Soil

9+3T = 12hours

Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis- Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets. Effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quicksand condition.

Compaction of Soil

3+1T = 4hours

Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density, concept of O.M.C. and zero Air Void Line. Compaction in field, compaction specifications and field control.

Part-B

Consolidation of Soil

9+3T = 12hours

Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, One – dimensional Terzaghi's theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation

Shear Strength

6+2T = 8hours

Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters: unconfined compression test, vane shear test

Stresses in soils

3+1T = 4hours

Stresses due to point load. Influence factors, Isobars, Boussinesq's equation, Newmark's Influence Chart, 2:1 load distribution method. Contact pressure under rigid and flexible area, computation of displacements from elastic theory

Soil Exploration

3+1T = 4hours

Introduction, methods of site exploration and soil investigation, methods of boring, soil samplers, sampling procedures, trial pits, borings, analysis of borehole logs, geophysical soil exploration methods

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech (Civil Engineering)
2018 Admission Batch Onwards

Text Books:

1. Arora K.R., “Soil Mech. & Foundation Engineering”, Standard Publishers Distributors, 2011
2. Ranjan G. and Rao A.S., “Basic and applied Soil Mechanics”, New Age International Publishers
3. Murthy V.N.S., “Soil Mech. & Foundation Engineering”, CBS Publishers & Distributors

Reference Books:

1. Principles of Geotechnical Engineering, by Braja M. Das, Cengage Learning
2. Principles of Foundation Engineering, by Braja M. Das, Cengage Learning
3. Soil Mechanics by Craig R.F., Chapman & Hall
4. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
5. Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
6. Geotechnical Engineering by Principles & Practices by Donald. P. Coduto, Pearson Education.

E-Books and online learning material:

1. Soil Mechanics and Foundation by BC Punmia, Ashok K Jain, Arun K Jain
<https://easyengineering.net/soil-mechanics-and-foundations-by-punmia>
2. Geotechnical Engineering by C. Venkatramaiah
<http://93.174.95.29/main/1DC69D69B5C9EEE6A7B8747692402614>

Online Courses and Video Lectures:

- | | |
|--|---------------------------|
| 1. https://nptel.ac.in/courses/105/101/105101201 | Accessed on Nov. 13, 2019 |
| 2. https://nptel.ac.in/courses/105/105/105105185 | Accessed on Nov. 26, 2018 |
| 3. https://nptel.ac.in/courses/105/105/105105168 | Accessed on Dec. 21, 2017 |

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus

B.Tech (Civil Engineering)
2018 Admission Batch Onwards
Subject Code: LPCCE106
Subject Name: Geotechnical Lab

Programme: B.Tech.	L: 0 T: 0 P: 2
Semester: 5	Teaching Hours: 24 Hours
Theory/Practical: Theory	Credits: 1
Internal Marks: 30	Percentage of Numerical/Design Problems: 100%
External Marks: 20	Duration of End Semester Exam (ESE): 1.5hours
Total Marks: 50	Elective Status: Compulsory

Prerequisites: Basics of Soil Mechanics

Additional Material Allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Comprehend the procedure for classifying coarse grained and fine-grained soils
2.	Evaluate the index properties of soil
3.	Determine the engineering properties of soil
4.	Interpret the results of compaction test for relative compaction in the field
5.	Apply modern engineering tools effectively and efficiently for geotechnical engineering analysis.
6.	Conduct experiments, analyze and interpret results for geotechnical engineering design

Detailed Contents:

1. Determination of in-situ density by core cutter method and Sand replacement method.
2. Determination of moisture content in soil sample using oven drying method.
3. Determination of Liquid Limit & Plastic Limit.
4. Determination of specific gravity of soil solids by pycnometer method.
5. Grain size analysis of sand and determination of uniformity coefficient (C_u) and coefficient of curvature (C_c).
6. Compaction test of soil.
7. Unconfined Compression Test for fine grained soil.
8. Direct Shear Test
9. Determination of Relative Density of soil.
10. Determination of permeability by Constant Head Method.
11. Demonstration of miscellaneous equipments such as Augers, Samplers, Rapid Moisture meter, Proctor's needle
12. Preparing a consolidated report of index properties and strength properties of soil

Text Books:

1. Soil Testing Engineering, Manual by Shamsher Prakash and P.K. Jain, Nem Chand & Brothers

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech (Civil Engineering)
2018 Admission Batch Onwards

2. A Laboratory Manual on Soil Mechanics: Testing and Interpretation by Ravi Kumar Sharma, I.K. International Publishing House Pvt. Ltd.

Reference Books:

1. Soil Mechanics and Foundation Engg.- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.
2. BIS Codes of Practice: IS 2720 (Part 2, 3, 4, 5, 7, 10, 13, 14, 17) – Methods of test for soils
3. Soil Testing for Engineers- Lambe T.W., Wiley Eastern Ltd., New Delhi
4. Manual of Soil Laboratory Testing- Head K.H., (1986)- Vol. I, II, III, Princeton Press, London.

E-Books and online learning material:

1. <http://home.iitk.ac.in/~madhav/geolab.html>

Online Courses and Video Lectures:

1. <https://nptel.ac.in/courses/105/101/105101160/>
2. www.nitttrchd.ac.in/sitenew1/nctel/civil.php

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus

B.Tech (Civil Engineering)
2018 Admission Batch Onwards
Subject Code: LPCCE-107
Subject Name: Environmental Engineering Laboratory

Programme: B.Tech.	L: 0 T: 0 P: 2
Semester: 5	Teaching Hours: 26 Hours
Theory/Practical: Practical	Credits: 1
Internal Marks: 30	Percentage of Numerical/Design Problems: --
External Marks: 20	Duration of End Semester Exam (ESE): Viva-voce
Total Marks: 50	Elective Status: Compulsory

Prerequisites: Nil

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Conduct experiments as per standard methods of sampling and analysis.
2.	Demonstrate the expertise to characterize water and wastewater samples.
3.	Understand the importance of laboratory analysis as a controlling factor in the treatment of water and wastewater.
4.	Record the experimental observations and interpret the analysis results.
5.	Use the analysis results for making informed decision about the potability of water and disposal of wastewater.
6.	Recognize the working of air pollution monitoring equipment and noise meter.

S. No.	Name of Practical
1.	Determination of pH value of a water/wastewater sample.
2.	Determination of Turbidity of a water sample.
3.	Determination of Hardness- total, calcium and magnesium hardness of a water sample.
4.	Determination of solids- total, dissolved, suspended, settleable solids of a water/wastewater sample.
5.	Determination of acidity and alkalinity of a water sample
6.	Determination of chlorides and sulphates in a water sample.
7.	Determination of Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) of a wastewater sample.
8.	Determination of Chemical Oxygen Demand (COD) of a wastewater sample.
9.	Determination of bacteriological quality of a water/wastewater sample.
10.	Determination of nutrients in wastewater (TKN, TN and TP).
11.	Demonstration of air pollution monitoring equipment.
12.	Demonstration of noise level meter.

Text/Reference Books:

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech (Civil Engineering)
2018 Admission Batch Onwards

1. Standard Methods for the Examination of Water and Waste Water, American Public Health Association, American Water Works Association, 2017.
2. Sawyer C.N., McCarty P.L. and Parkin G.F., Chemistry for Environmental Engineering and Science, 5th Edition, McGraw Hill, 2003.
3. Manuals of analytical equipments.

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus

B.Tech (Civil Engineering)
2018 Admission Batch Onwards

Subject Code: LPCCE108
Subject Name: Structural Lab

Programme: B.Tech.	L: 0 T: 0 P: 2
Semester: 5	Teaching Hours: 24 Hours
Theory/Practical: Practical	Credits: 01
Internal Marks: 30	Percentage of Numerical/Design Problems: -
External Marks: 20	Duration of End Semester Exam(ESE): 1.5 Hours
Total Marks: 50	Elective Status: Compulsory

Prerequisites: NIL

Additional Material Allowed in ESE: NIL

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Verify theoretical formulas by conducting experiments.
2.	Predict the behavior of statically determinate beams and trusses.
3.	Depict the behavior of two hinged arch and three hinged arch structures.
4.	Demonstrate the influence lines for statically determinate and indeterminate beams.
5.	Observe and compute deflections of simply supported beams, curved beams and frames using classical methods.
6.	Outline the deflected shapes of columns and struts with different end conditions.

Detailed Contents:

1. Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
2. To determine the Flexural Rigidity of a given beam.
3. To verify the Moment- area theorem for slope and deflection of a given beam.
4. Deflection of a fixed beam and influence line for reactions.
5. Deflection studies for a continuous beam and influence line for reactions.
6. Study of behaviour of columns and struts with different end conditions.
7. Experiment on three-hinged arch.
8. Experiment on two-hinged arch.
9. Deflection of a statically determinate pin jointed truss.
10. Forces in members of redundant frames.
11. Experiment on curved beams.
12. Unsymmetrical bending of a cantilever beam.

Text Books:

Laboratory Manual on Structural Mechanics by Dr. Harvinder Singh; New Academic Publishing Comp. Ltd

E-Books and online learning material:

1. Structural Analysis Lab by Lakshman Singh

<http://www.dbit.ac.in/ce/syllabus/structural-analysis-lab.pdf>

Guru Nanak Dev Engineering College, Ludhiana
Department of Civil Engineering
Syllabus
B.Tech (Civil Engineering)
2018 Admission Batch Onwards

Online Courses and Video Lectures:

<https://lecturenotes.in/practicals/36000-lab-manual-for-structural-analysis2-sa2-by-prashant-kumar?reading=true>