

**Guru Nanak Dev Engineering College Ludhiana**  
**Civil Engineering Department**

**Minor Engineering Degree**

The students of branches other than B.Tech (CE) can opt for minor engineering degree as per the following guidelines:

1. The students need to earn 20 credits to qualify Minor Engineering Degree in B.Tech (CE), out of which 06 to 08 credits need to be earned through MOOCs and remaining credits have to be earned through class room teaching for which list of courses is as given below:

Course Type	Course Code	Course Name	Load Allocations			Marks Distribution			Credits
			L	T	P	Int	Ext	Total	
Core Theory	MnPCCE-01	Geomatics and Surveying	3	0	0	40	60	100	3
Core Theory	MnPCCE-02	Building Material and Construction	3	0	0	40	60	100	3
Core Theory	MnPCCE-03	Water Resources and Environmental Engineering	3	0	0	40	60	100	3
Core Theory	MnPCCE-04	Geotechnical and Transportation Engineering	3	0	0	40	60	100	3
Core Theory	MnPCCE-05	Fundamentals of Structural Engineering	3	0	0	40	60	100	3
Core Lab	MnLPCCE-01	Material Testing and Surveying Laboratory	0	0	2	20	30	50	1

2. The list of MOOCs offered for the current semester (July –November 2019) is uploaded on departmental website.
3. Passed out students can also avail the option of pursuing minor degree in the Civil Engineering. However, the minor degree must be completed within stipulated period as notified by IKG PTU for the completion of the B.Tech.
4. The allotted seats for minor degree in Civil Engineering are 50 and allocation will be done on merit basis.
5. The duly filled proforma (available on departmental website) forwarded by head of the parent department must be submitted in the Civil Engineering Department by 5<sup>th</sup> August, 2019. The results of 1<sup>st</sup> and 2<sup>nd</sup> semester should be attached with the proforma.

## MnPCCE-01 Geomatics and Surveying

### Syllabus Content:

#### Part-A

- **Introduction to Surveying:** Principles, Survey stations, Survey lines- ranging, direct & indirect ranging, Bearing and its measurement with prismatic compass, calculation of angles from bearings, Leveling:, Principles of leveling- booking and reducing levels; differential, reciprocal leveling, profile leveling and cross sectioning. Digital and Auto Level, Errors in leveling; contouring: Characteristics, methods, uses; areas and volumes. Setting up the plane table and methods of plane tabling (Radiation and three point problem only).
- **Triangulation and Traversing:** Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Tachometry: Definition, determination of tachometer constants and reduced level from tachometric observations. Triangulation - network- Signals. Baseline - choices - corrections - Curves: Elements of simple and compound curves – Method of setting out Simple curve – length of curve.

#### Part-B

- **Modern Field Survey Systems:** Principle of Electronic Distance Measurement, Total Station – Parts of a Total Station – Accessories – Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, errors and biases, DGPS measurements.
- **Photogrammetry Surveying:** Introduction, Basic concepts, flight planning; photographic mapping- mapping using stereo plotting instruments, mosaics.
- **Remote Sensing:** Introduction – Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors.

### Reference Books:

1. Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2. Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Surveying Vol. I, II & III, Laxmi Publications
3. Agor, R., Surveying, Khanna Publishers
4. Bhavikatti, S.S. Surveying & Levelling Volume I & II

**MnPCCE-02 Building Material and Construction****(Credits - 3:0:0 = 3)**

Teaching Scheme  
Lectures: 3 hrs/week

**Syllabus Content:**

**Building Materials:** Stone as building material; Requirement of good building stones, Dressing of stones, Deterioration and Preservation of stone work. Bricks; Classification, Manufacturing of clay bricks, Requirement of good bricks. Field and laboratory tests on bricks, Cement Concrete blocks, Requirement of good blocks. Mortar: types and requirements. Timber as construction material, Aggregate: Natural and manufactured, Requirements of good aggregates, Physical properties of aggregates, Cement: Manufacturing process, Varieties of cement, Hydration of cement, Properties and testing of cement. Concrete: Introduction, Constituents of concrete, batching of materials, manufacturing process of cement concrete, workability and factors affecting it, determination of workability

**Foundation:** Preliminary investigation of soil, safe bearing capacity of soil, Function and requirements of good foundation, types of foundation, introduction to spread, combined, strap, mat and pile foundation

**Masonry:** Definition and terms used in masonry. Brick masonry, characteristics and requirements of good brick masonry, Bonds in brick work, Header, Stretcher, English, Flemish bond, Stone masonry, Requirements of good stone masonry, Classification, characteristics of different stone masonry, Joints in stone masonry. Types of walls; load bearing, partition walls, cavity walls

**Lintels and Arches:** Definition, function and classification of Lintels, Balconies, Chajja and Canopy. Arches; Elements and Stability of an Arch.

**Floors and roofs:** Floors; Requirement of good floor, Components of ground floor, Selection of flooring material, Laying of Concrete, Mosaic, Marble, Granite, Tile flooring, Cladding of tiles. Roof;-Requirement of good roof, Types of roof & Elements, Different roofing materials, RCC Roof

**Doors, Windows and Ventilators:** Location of doors and windows, technical terms, Materials for doors and windows, Paneled door, Flush door, Collapsible door, Rolling shutter, PVC Door, Paneled and glazed Window, Bay Window, French window. Ventilators. Sizes as per IS recommendations

**Stairs:** Definitions, technical terms and types of stairs, Requirements of good stairs

**Form-work:** Introduction to form work, scaffolding, shoring, under pinning

**Plastering and Pointing :** purpose, materials and methods of plastering and pointing, defects in plastering

**Damp proofing:** causes, effects and methods.

**Paints:** Purpose, types, ingredients and defects, Preparation and applications of paints to new and old plastered surfaces, wooden and steel surfaces.

**Reference Books:**

1. Sushil Kumar "Building Materials and construction", Standard Publishers
2. Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain, "Building Construction", Laxmi Publications (P) Ltd.
3. Rangawala S. C. "Engineering Materials", Charter Publishing House
4. S.K.Duggal, "Building Materials", (Fourth Edition)New Age International (P) Limited
5. National Building Code(NBC) of India
6. P C Vergese, "Building Materials", PHI Learning Pvt. Ltd.
7. Building Materials and Components, CBRI
8. Jagadish, K.S, "Alternative Building Materials Technology", New Age International
9. M. S. Shetty, "Concrete Technology", S. Chand & Co.

**MnPCCE-03 Water Resources and Environmental Engineering****(Credits - 3:0:0 = 3)**

Teaching Scheme

Lectures: 3 hrs/week

**Syllabus Content:****Part-A**

- **Water resources needs:** Consumptive and non-consumptive water use, Estimation of water requirements for irrigation, drinking and navigation.
- **Precipitation, Infiltration and Evapotranspiration:** Forms of precipitation, measurement, depth-area-duration and intensity duration- frequency relations, Evaporation -- process, measurement, and estimation, Infiltration -- process, measurement, and estimation, Evapotranspiration -- measurement and estimation
- **Runoff:** Rainfall-Runoff correlations, Droughts and Floods
- **Groundwater Hydrology:** Confined and unconfined flow
- **Watershed Management:** Water shed and its management, its relation to hydrologic cycle

**Part-B**

- **Introduction:** Water demand, per capita demand, variations in demand, and water demand for fire fighting, water demand estimation
- **Quality and Examination of Water:** Impurities in water, sampling of water, physical, chemical and bacteriological water quality parameters, drinking water quality standards and criteria.
- **Water treatment:** Water treatment schemes; Basic principles of water treatment; plain sedimentation, coagulation and flocculation, filtration, Disinfection units
- **Sewerage system:** Systems of sanitation and their merits and demerits, system of sewerage, choice of sewerage system and suitability to Indian conditions. Generation and estimation of community wastewater
- **Characteristics of wastewater:** Physical, chemical and microbiological analysis of domestic wastewater.
- **Treatment of wastewater:** Introduction to unit operations and processes - Screening, grit chamber, sedimentation tanks, activated sludge process

**Reference Books:**

1. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill
2. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers
3. Peavy H.S., Rowe D.R., Tchobanoglous G., "Environmental Engineering", McGraw-Hill
4. Nathanson J.A., Schneider R.A., "Basic Environmental Technology", Prentice Hall of India
5. Davis M.L., Cornwell D.A. "Introduction to Environmental Engineering", McGraw-Hill

**MnPCCE-04 Geotechnical and Transportation Engineering****(Credits - 3:0:0 = 3)**

Teaching Scheme  
Lectures: 3 hrs/week

**Syllabus Content:****Part-A**

- **Introduction to Geotechnical Engineering:** Definition of Soil, Soil Formation. Transported and Residual Soils. Soils of India. Importance of Soil Mechanics in Civil Engineering. Weight Volume Relationship: Constituents of Soils. Phase Diagram. Definitions of void ratio, porosity, degree of saturation, moisture content, specific gravity, unit weight, density index, air content. Derivations of Functional relationships. Atterberg's Limits (Liquid, Plastic and Shrinkage Limits).
- **Soil Classification and Identification:** Particle size and shape and their effect on engineering properties of soil. Field identification test for coarse grained and fine grained soils. Indian Standard Soil Classification System. Flow of Water through Soils: Darcy's Law. Laboratory determination of Permeability of Soil. Factors affecting Permeability. Average Permeability of Stratified Soil Mass. Coefficient of Permeability of different types of soils.
- **Stresses in Soils:** Free Water. Structural Water. Effective Stress. Neutral Stress. Total Stress. Principle of Effective Stress. Earth Pressure: Active and passive earth pressure.
- **Compaction and Consolidation:** Definition and concept of Compaction. Factors affecting Compaction. Laboratory Compaction Tests. Definition of Optimum Moisture Content (OMC). Maximum Dry Density. Moisture – Dry Density relationship for typical Soils with different Compactive Efforts. Definitions and types of consolidation. Excess Pore pressure.
- **Shear Strength and Bearing Capacity:** Importance of determination of shear Strength. Definition of: Cohesion, Angle of Internal Friction, Angle of Repose. C, F and C-F Soils. Coulomb's Equation. Concept of Ultimate Bearing Capacity. Safe Bearing Capacity. Allowable Bearing Capacity. Factors affecting Bearing Capacity. Definition of Shallow and Deep Foundations. Introduction of Terzaghi's Bearing Capacity Equation and basic numerical.

**Part-B**

- **Geometric design of highways:** A brief historical review of how highway construction methodology evolved. Highway development in India, Road Development Plans, IRC classification of urban and rural roads, Expressways, Cross section elements: Right of way, Carriage way, Camber, Kerbs, Shoulders and Footpaths, Highway cross-sections
- **Highway Geometric Design:** Sight distance, Super elevation, Horizontal alignment design, Types of horizontal curves, Vertical Alignment Design, Types of vertical curves.
- **Traffic Engineering:** Traffic characteristics, Traffic studies, Traffic volume studies, Speed studies, Origin and destination study, Traffic flow characteristics, Traffic capacity, Traffic Density, Space and time Headways, Accident studies, Planning and design of intersections, Traffic control devices.
- **Highway Materials:** Desirable Properties of sub grade soil, Stone aggregates and Bituminous Materials, Tests on stone aggregates (Crushing, Abrasion and Impact Test for aggregates), Tests on bituminous materials (Penetration, Ductility, Viscosity, Binder content and Softening point Tests),
- **Highway Construction:** Water bound Macadam, Bituminous and Concrete roads

**MnPCCE-05 Fundamentals of Structural Engineering****(Credits - 3:0:0 = 3)**

Teaching Scheme

Lectures: 3 hrs/week

**Syllabus Content:**

- Role of engineer, architect, builder and end-user in a construction activity/project, first principles of planning and design process
- Concept of structure, what makes a structure, its need and types; Load, types of load and its assessment; principles of stability, equilibrium; Concept and importance of load path, its selection
- **Structural analysis:** Effect of load on structural member/system, displacements, stresses and strains; their importance and calculation; Analysis of determinate and redundant structural systems - beams, arches, trusses, frames
- **Materials:** Concrete and steel; their behavior and properties
- **Design of Structural Elements:** Design safety and structural design criteria; Role of standards (BIS) and design of beams, slabs, stairs, columns, footings; Durability aspects; Construct-ability and structural control; Fire protection.

**MnLPCCE-01 Material Testing and Surveying Laboratory****(Credits - 0:0:2 = 1)**

Teaching Scheme

Lectures: 2 hrs/week

**List of Experiments:**

1. Stress strain curve of steel
2. Standard consistency, initial & final setting times and compressive strength of cement
3. Compressive strength of brick and concrete
4. Flexural strength of a wooden beam
5. Coefficient of curvature and uniformity by sieve analysis of sand
6. Liquid and plastic limit of soil and classify the soil as per Indian standard
7. To determine the impact value of aggregates
8. To determine the bitumen content in a given sample of surface course
9. Determination of height of an inaccessible object
10. Use of total station & GPS