Departmental Practical

Course Type	Course Code	Name of Course	L	T	P	Credit
DP	NCEC512	Computational Laboratory-II	0	0	3	1.5

Course Objective
The course aims at imparting knowledge on computational aspect of Civil Engineering
Learning Outcomes
Upon successful completion of this course, the students should be able to: • Learn the theories in mechanics of geomaterials, mechanics of deformable solids, engineering hydrology and hydraulics and transport system design & management

Unit No.	Topics to be Covered	Contact Hours [P]	Learning Outcome
1	**Problem-1:** Slope and Seepage Analysis, Earthquake Analysis of Geostructures	03	Learn to solve the slope stability and seepage analysis problems using Finite Element Method
2	**Problem-2:** Analysis and Design of Mechanically Stabilized Earth Retaining Walls	03	Learn to design the reinforced earth structures using Finite Element Method
3	**Problem-3:** Footing on Clayey soil using modified cam-clay model	03	Application of critical state mechanics
4	**Problem-4:** Introduction to Discrete Element Method	03	Application of Discrete Element Method
5	**Problem-5**: Problem on fitting desired probability distribution on hydrological data.	03	Application of probability theory
6	**Problem-6**: Problem on flood frequency analysis	03	Learn to estimate return period of floods
7	**Problem-7:** Problem of computing standardized indices of hydrological extremes	03	Learn to identify and quantify extreme events
8	**Problem-8:** To identify the shortest and most efficient commuter routes within an urban area	03	Learn to analyze shortest path, set up network data, and propose optimized routes

Unit No.	Topics to be Covered	Contact Hours [P]	Learning Outcome
9	**Problem-9:** To assess and map public transport accessibility within a city, identifying underserved areas that require enhanced transit coverage.	03	Learn to create service area buffers, overlay demographic data, and analyze transit accessibility
10	**Problem-10:** To identify high-risk areas for traffic accidents within a city to prioritize road safety improvements.	03	A heatmap identifying accident hotspots, supporting targeted interventions for road safety improvements in high-risk areas
11.	**Problem-11:** Solution of 3D Bernoulli frame by using the finite element method through programming in MATLAB®.	03	Learn to write program in finite element method to solve frame problems.
12.	**Problem-12:** Solution of Kirchhoff plate by using the finite element method through programming in MATLAB®.	03	Learn to write program in finite element method to solve plate problems.
13.	**Problem-13:** Solution of plane stress/plane strain problems by using the finite element method through ANSYS®/ABAQUS® software.	03	Learn to use finite element based software to solve 2D problems.
14.	**Problem-14:** Solution of 2D frames by using the finite element method through ANSYS®/ABAQUS® software.	03	Learn to use finite element based software to solve 2D frames.
	Total	42	

Text Books:

1. Budhu, M. (2010). Soil Mechanics and Foundations, 3rd Edition, Wiley.
2. Ferreira, A. J. (2009). MATLAB codes for finite element analysis. Amsterdam: Springer Netherlands.
3. Maity, R. (2018). Statistical methods in hydrology and hydroclimatology (Vol. 585). Springer.
4. Sarkar, P.K., Maitri, V., and Joshi, G.J. (2016). Transportation Planning, Principles, Practices and Policies, PHI Pvt. Ltd.