



# GUJARAT TECHNOLOGICAL UNIVERSITY

## CIVIL (Geotechnical ENGINEERING) (43)

Master of Engineering

Subject Code: 3734307

Semester – III

Subject Name: Computer Applications in Geotechnical Engineering

Type of course: Program Elective-V

**Prerequisite:** Knowledge of MS office and programming of small problems in any computer language, Soil Mechanics, Foundation Engineering

**Rationale:** To analyse and design any type of foundation under various loading conditions requires to be modeled using either available software's or through formulating programme using computer languages. Due to increase in complexity of problems in civil engineering structures and advancements in site investigations with more available parameters, its simulation can be done using software's or by developing computer programs to solve the problems and optimize the design with better understanding.

### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE(E)	PA (M)	ESE (V)	PA(I)	
3	0	0	3	70	30	0	0	100

### Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Various computer programming languages and software for Geotechnical programming.	06	10
2	Limit equilibrium method for Geotechnical elements and its simulation.	04	08
3	Use of Micro Processing in data acquisition and data interpretation. Data transformation	04	08
4	Application Programme: (In excel or any other computer language) For determination of 1. Soil particle size distribution (sand%, silt%, clay%) 2. Shear strength parameters of soil, 3. Co-efficient of permeability for flow through layered soil – (a) Parallel to layers, (b) Perpendicular to layers 4. Consolidation parameters of soil and computation of Settlement, safe and allowable bearing capacity of soil.	12	25
5	FEM Analysis of simple Geotechnical Problems using PLAXIS Software : Modeling of shallow foundations, deep foundations, retaining walls, reinforcement structures (nail, geosynthetic), embankments and cuttings,	10	25



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	and underground structures.		
6	Application of ANN Modeling in area of Geotechnical Engg and MATLAB	06	14

### Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	30	20	10	10

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### Reference Books:

1. Computer Programming and Numerical Methods by Swamisaran, P.K.Swamy & Singh. Asia Publication.
2. Computational methods for Geotechnical elements by L.Mullar. Course note, SprInger-Verlag Publications
3. Bowels, J.E., "Analytical and Computer methods in Foundation" McGraw Hill Book Co., New York.
4. Desai C.S. and Christian J.T., "Numerical Methods in Geotechnical Engineering" McGraw Hill Book Co. New York.
5. M.G.Salvadori and M.L.Baron, Numerical Method in Engineering.
6. Syal and Gupta, Computer Programming and Engg. Analysis.

### Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Student will be aware of software tools available in the market and will know its benefits for projects.	15
CO-2	Student will be able to select particular computer language and simulate limit state conditions for geotechnical problems	10
CO-3	Student can formulate, exhibit, and analyse various geotechnical applications including index and engineering properties for various soil strata.	35
CO-4	Student will be able to distinguish use of FEM software and will be able to model foundations with boundary conditions and other retaining structures as per project requirement.	25
CO-5	Student will be equipped with latest ANN tools, MATLAB tools used in modelling geotechnical issues through numerical analysis.	15



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## **List of Experiments/Tutorial:**

Tutorial work shall consist of presentations / problems / preparation of learning material based on above topics. Apart from above assignments a group of students has to undertake one open ended design problem based on engineering application.

## **List of Open Source Software/learning website:**

1. NPTEL lecture series
2. MIT open source material