CIVIL ENGINEERING DEPT.

M.Sc.- SOIL MECHANIC

2024-2025

M.Sc-STUDIES SOIL MECHANIC ENGINEERING

First Course

Item	code	Subjects	Units	Hr.	
				Theoretical	**Practical**
1.	Eng. Civil 512	ADVANCE ENGINEERING MATHEMATICS	2	2	–
2.	Eng. Civil 513	NUMERCAL ANALYSIS	2	1	2
3.	Eng.Civil 520	SPECIAL TOPICS	2	2	--
4.	Eng. Civil 515	ADVANCED SHEAR STRENGTH AND APPLICATION	3	2	2
5.	Eng.Civil 516	GROUND IMPROVEMENT	3	3	–
6	Eng.Civil 505	ENGLISH LANGUAGE	1	–	2
		TOTAL	**13**	**10**	**6**

Second Course

Item	code	Subjects	Units	Hr.	
				Theoretical	**Practical**
1.	Eng. Civil 514	ADVANCED MECHANICS of MATERIAL	3	2	2
2.	Eng. Civil 517	ADVANCED STRESSES AND SETTLEMENT ANALYSIS	2	2	--
3.	Eng. Civil 518	FINIT ELEMENT	2.5	2	1
4.	Eng. Civil 519	FOUNDATION ENGINEERING	2.5	2	1
5.	Eng.Civil 521	EARTH STRUCTURES	2	2	--
6.	Eng.Civil 511	ENGLISH LANGUAGE	1	–	2
		TOTAL	**13**	**10**	**6**

ADVANCE ENGINEERING MATHEMATICS\ Eng. Civil 512

- Series Solution of Differential Equations:
    - Power series method.
    - Legender equation
    - Legender polynomials
    - Extended power series method.
- Singularity Functions:
    - Unit step function
    - Delta function
    - Doublet function
    - Integration of singularity functions
    - Applications.
- Laplace transformation:
    - Laplace transformation, inverse transform
    - transform of derivatives.
    - Shifting Laplace transformation, inverse transform
    - Laplace on the S and T axis.
    - Laplace transform of Singularity Functions.
    - Differentiation and integration of transform
    - Convolution, integral equation
    - Periodic Functions
    - Applications

- Partial differential equations:
    - Basic concepts
    - One dimensional wave equation
    - Free longitudinal vibrations of prismatic beams
    - One dimensional heat equation
    - One dimensional Consolidation equation
    - Free transverse vibrations of prismatic beams
    - Two dimensional Laplace equation
    - Laplace transformation applied To partial differential equations

NUMERCAL ANALYSIS\ Eng. Civil 513
1. Solution of linear system of equations.

2. Eigenvalues and eigenvectors.

3. Roots of non-linear equations.

4. Solution of ordinary differential equations.

5. Solution of partial differential equations.

6. Finite difference method.

7. Interpolation.

8. Numerical integration.

ADVANCED MECHANICS of MATERIAL\ Eng. Civil 514
1. Introduction and basics of elasticity.

2. Stress Strain Relationship.

3. Direct, shear and torsion stresses.

4. The kinetic equation.

5. The equilibrium equations.

6. Experimental strain analysis.

7. Viscoelasticty .

ADVANCED SHEAR STRENGTH APPLICATION\Eng. Civil 515
1- Shear strength (Saturated and unsaturated soil, Effective stresses, Pore

   water pressure parameters, stress path),

2- Slope stability.

3- Experimental tests (Index tests, Triaxial test for soil and rock,

Rowe cell, Collapse and swelling tests, etc)

GROUND IMPROVEMENT \ Eng. Civil516
1. Problematic soils.

2. Expansive soils and introduction to clay mineralogy.

3. Mechanical stabilization.

4. Soil Stabilization (Cement stabilization, Lime stabilization, Asphalt stabilization).

5. Combined stabilization.

6. Deep compaction methods.

7. Introduction to grouting.

8. Introduction to reinforced earth and geotextiles.

ADVANCED STRESSES AND SETTLEMENT ANALYSIS\Eng. Civil 517

1. Stresses distribution in soils.

2. Compressibility and volume change.

3. Settlement analysis.

FINIT ELEMENT\ Eng. Civil 518

1 - Introduction.

   Variational methods numerical solution, general concept of the finite element method.

2- Programming review, computer methods for problems solving.

3- Finite element formulation - physical types of problems element type , interpolation shape functions.

4- Elements assembling - solution methods, with simple examples using Fortran language .

5- Introduction in using finite element software instead of programming in Fortran Using ANSYS preprocessing

6- Problem modeling - solution - postprocessing using ANSYS

7- Applications on soil problems, seepage & soil structure Interaction.

FOUNDATION ENGINEERING\ Eng. Civil 519

1- Introduction.

2- Sub-grade reaction.

3- Field test and their usage in bearing capacity.

4- Bearing capacity of shallow and deep foundation.

Pile foundation.

SPECIAL TOPICS IN SOIL MECHANICS\ Eng. Civil 520

1- Rock mechanics (6 weeks)

2- Introduction to soil dynamics (3 weeks)

3- Geotechnical site investigation (3 weeks)

4- Drilled caissons (3 weeks)

EARTH STRUCTURES\ Eng. Civil 521

1- Seepage flow and application
2- Lateral earth pressure (Coulomb and Rankine earth pressure theories
3- Retaining walls
4- Sheet piles
5- Anchored bulkheads
6- Bracing of excavation)
7- Flexible retainin