SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

B.Tech. III Year Semester – VI

Subject Name : Advances in Geotechnical Applications **Subject Code:** BTCL14606

Type of course : PEC III

Prerequisite : Fundamental of Soil Mechanics (BTCL13402) & Applied Soil Mechanics (BTCL13501)

List of Courses where this course will be prerequisite: ---

Rationale: To impart advanced theory of mechanics governing the behavior of different soils to students so that they are able to understand the behavior of foundations and structures constructed in/on them.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	100
3	0	0	3	60	25	15	__	__	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2**: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE**: Term End Examination **TEP**: Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3**: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Sr. No.	Content	Total Hrs	Module Weightage
1.	**Stress-Strain Mechanism in Soil** ---Stresses and displacements in soil: soil as elastic body -concept of effective stress - equations of equilibrium in soil mass -principal stresses and strains -problems of plane stresses and strains - stress distribution by Boussenesq, Westerdgards theory – Newmark's chart -influence of anisotropy on stress distribution - applications to geotech problems	8	25 %
2.	**Shear Strength Mechanism in Soil** --- Shear resistance: stress -strain relationship in soils -failure criteria –Mohr Coulomb's failure - shear parameters under different drainage conditions construction - pore pressure in saturated and unsaturated soils -analytical predictions of pore water pressures -stress dilatency theory - results of plain strain shear tests	10	25 %
3.	**Consolidation Mechanism in Soil** ---- Mechanics of consolidation: phenomenon of consolidation -Terzaghi's theory of unidimensional consolidation - methods to determine precompression history -applications to estimate settlements -introduction of creep and stress relaxation by rheological models.	8	15 %

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4.	**Flow through Soil Mechanism** ---- Mechanics of flow through soils: flow through soils -unidimensional - radial and Spherical flow cases -seepage forces quick sand and piping - flow nets of confined and unconfined flow by relaxation techniques - phreatic surfaces by conformal mapping -flow net for anisotropic nonhomogeneous soils	8	15 %
5.	**Advance in soil Exploration and Testing ---** Pressure Meter Testing of Soils , Dilatometer Testing of Soils , Electrical Resistivity Methods , Seismic Refraction Method, In-Situ vane shear strength , Standard penetration tests , Dynamic cone penetration tests , Static cone penetration tests , auger Test	8	20 %

Content:

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**15**	**20**	**25**	**20**	**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 Text Books:

Sr. No.	**Title of book /article**	**Author(s)**	**Publisher details like ISBN**	**Year of publication**	**Publication Edition**
1.	Soil Engineering in Theory and Practice Asia Pub. House.	Singh Alam	Asia Pub. House.ISBN021022552 19780210225523	1981	2nd
2.	Foundation Analysis and Design	Bowles, Joseph E.	Mc-Graw Hill. ISBN0-07-912247-7	1996	5th
3.	In Situ Testing in Geomechanics	Fernando Schnaid	Taylor and FrancisISBN978042915 2603	2009	1st
4.	Advanced Soil Mechanics	Das, Braja, M.	Taylor & Francis ISBN9781351215183	2019	5th
5.	Soil Mechanics in Engineering Practice	Karl TerzaghiRalph B. PeckGholamreza Mesri	John Wiley ISBN: 978-0-471-08658-1	1967	3rd
6.	Soil Mechanics	Lambe, T. William Whitman,	John Wiley ISBN78-0-471-51192-2	2000	2nd

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7.	Foundation of Theoretical Soil Mechanics	Harr M. E.	Tata McGraw Hill Book Co., New York ISBN 10: 0229003222 ISBN 13: 9780229003228	1966	3rd
8.	Design Aids in Soil Mechanics &Foundation Engineering	Kaniraj S R	Tata McGraw Hill Publishing Co. Ltd., New DelhiISBN0074517147 / 9780074517147	2013	4rth
9.	Foundation Design Manual	Dr. N.V.Nayak	DhanpatRai Publications ISBN-10 9383182903	2018	7th
10	The Mechanics of Soils: An introduction to critical soil mechanics	Atkinson, J.H. and Bransby, P.L	McGraw Hill ISBN 0070840776, 9780070840775	1978	2nd

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

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Establish the stresses develop in soil and displacement take place in soil, evaluate stress analysis*(R,U,A-Cognitive level)*	20
CO-2	Access the stress-strain relationship develop in soil, failure criteria and evaluate soil parameters. *(U,A,E,N-Cognitive level)*	25
CO-3	Classify and Identify the consolidation characteristics of soil, its estimation and analysis. *(R,U,A,E - Cognitive level)*	25
CO-4	Derive the seepage properties of soil, seepage analysis of soil, quick sand condition. *(A,E,C - Cognitive level)*	15
CO-5	Design the methods of soil exploration and importance of site investigation. *(R,U,A-Cognitive level)*	15

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Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO-1	3	3	1	-	-	-	-	-	-	1	-	-	-	-	-
CO-2	3	2	2	1	-	-	1	-	-	2	-	-	-	-	-
CO-3	3	2	1	2	1	-	1	-	-	-	1	-	-	-	-
CO-4	3	2	2	1	-	1	2	-	1	1	1	1	-	-	-
CO-5	3	2	2	2	3	2	2	1	-	2	2	1	-	-	-
Rationale*	**15**	**11**	**08**	**06**	**04**	**03**	**06**	**01**	**01**	**06**	**04**	**02**	**-**	**-**	**-**

Rationale*: All CO's are compatible and matching to the derived POs to several extents**.** This subject impart advanced theory of mechanics governing the behavior of different soils to students so that they are able to understand the behavior of foundations and structures constructed in/on them.

List of Open learning website:

- https://nptel.ac.in/courses/105/103/105103207/ r
  - Module 1, 2, Lecture 1 to 6, 7 to 11
- https://nptel.ac.in/content/storage2/courses/105103139/pdf/mod6.pdf
  - Module 2
- https://nptel.ac.in/content/storage2/courses/105101001/downloads/L41.pdf
  - Module 3
- Lecture Series on Soil Mechanics by Prof. B.V.S. Viswanadham, Department of Civil Engineering, IIT Bombay. NPTEL visit http://nptel.iitm.ac.in
  - Module 4
- Advanced Foundation Engineering by Dr. Kousik Deb, Department of Civil Engineering, and IIT Kharagpur. NPTEL visit http://nptel.ac.in
  - Module 5

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