

GUJARAT TECHNOLOGICAL UNIVERSITY

Semester – II

M.E.(Civil – Geotechnical Engineering) w.e.f. (28/2/2012)

PROPOSED TEACHING SCHEME (SEMESTER-II)

SUBJECT CODE	NAME OF SUBJECT	TEACHING SCHEME(HOURS)			CREDITS
		THEORY	TUTORIAL	PRACTICAL	
1720001	Principles of Management	3	0	0	3
1724301	Finite Element Method in Geotechnical Engineering	4	0	0	4
1724302	Analysis & Design of Foundation Systems	4	2	0	5
	Major Elective - II	3	0	2	4
	Major Elective - III	3	2	0	4
	Inter Disciplinary Elective - II	4	0	0	4
1724308	Geotechnical Engineering Software LAB 2	0	2	0	1
	Total	21	6	2	25

SUBJECT CODE	Inter Disciplinary Elective - II
1724307	Element of Machine Foundation

SUBJECT CODE	Major Elective -II
1724303	Geosynthetics & Reinforced Earth
1724304	Marine Geotechniques

SUBJECT CODE	Major Elective - III
1724305	Earth and Rockfill Dams
1724306	Machine Foundations Design

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Master of Engineering (Civil – Geotechnical Engineering)

Semester – II

Subject Code: 1724301

Subject Name: **Finite Element Method in Geotechnical Engineering**

1.	Introduction: Principles of discretization, Element stiffness mass formulation based on direct, variational and weighted residual techniques.
2.	Finite element displacement approach: Shape functions & numerical integrations, convergence criteria, Computation of element properties using generalized co-ordinates & natural co-ordinates.
3.	Analysis of Structures – 2D and 3D truss elements, beam elements. Analysis of plane stress/strain and axisymmetric solids. Triangular, quadrilateral and isoparametric elements. Analysis of plate bending and shells.
4.	Analysis of Thermal and fluid flow Problems and application.
5.	Dynamic analysis: Free vibration analysis of truss bars with two D.O.F.- considering lumped mass and consistent mass formulations. Flexural vibration of beam elements
6.	Pre- processors for FEA modeling. FEA software packages and Applications.

Reference Books:

1. Finite Elements Procedures in Engineering analysis - Bathe, Wilson
2. Finite Element for Structural Analysis - Weaver & Johnston
3. The Finite Element Methods - Zienkiewicz
4. Introduction to Finite Elements in Engineering - Chandrupatla, R.T. & Belegundu, A.D
5. Finite Element Programming - Hinton & Owen
6. Finite Elements Methods - C.S.Krishnamurthy

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Master of Engineering (Civil – Geotechnical Engineering)

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Subject Code: 1724302

Subject Name: **Analysis and Design of Foundation Systems**

1.	Introduction to Limit State Design of reinforced concrete in foundations;
2.	Design methods of rectangular, trapezoidal and strap beam;
3.	Soil pressure for structural design; Conventional structural design of continuous footings, individual footings, combined footings and rafts of various types subjected to vertical and lateral loads and moments; Design of circular rafts;
4.	Soil structure interaction and 'flexible' approach to the design of foundations;
5.	Structural design of piles including pile caps, under reamed piles, piers and caissons;
6.	Structural design of retaining walls;
7.	Special foundations; Introduction to shell foundations;

Reference Books:

1. Joseph E Bowles, "Foundation Analysis & Design", Mc Graw Hill, 1996
2. Shamsheer Prakash et.al, Analysis and Design of Foundation and Retaining Structures, Sarita Prakashan
3. Nayak N.V., Foundation Manual for Practising Engineers, Dhanpatrai Publications
4. Robert W Brown, Practical Found. Engg, Handbook, Mc Graw Hill Pub, 1996
5. Das B.N., Principles of Found Engg, 4th ed, PWS Pub.Co., 1999
6. S.P. Brahama, Foundation Engg, Tata McGraw Hill, 1985
7. Zeevert, Found.Engg for Difficult Sub Soil Condition, Van Nostrand Publin., 1975
8. Fang and Winterkorn, Found.Engg, Handbook, Van Nostrand Publn., 1975

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Subject Code: **1724303**

Subject Name: **Geosynthetics And Reinforced Earth (Major Elective II)**

1.	Concept of Reinforced Earth- Mechanism and working - Factors influencing components; Analysis, design and stability of reinforced mass. Application and Techniques of construction, Performance comparison of different types of facial elements and reinforcing elements. Performance and case studies of reinforced earth walls, embankments, road subgrades, foundation beds etc
2.	Geosynthetics-Geogrids, geotextiles and Geomembranes. Their physical and manufacturing properties. Functions: reinforcement, separation, filtration and Drainage. Their use in formations of roads and railways tracks, in reinforced embankments, in erosion protection of bunds, as filter-cum-drain in earth dams and drains, for lining of canals and in prevention of pollution. Ground improvement of soft soil by Geodrains.

Reference Books

1. Membranes in Ground Engineering by P. R. Rankilior, John-Wiley & Sons.
2. Geotextiles and Geomembranes in Civil Engineering by R. V. Van Zanken, A. A. Balkema Publication.
3. Geotextile Handbook by T. S. Ingold and K. S. Miller.

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Subject Code: **1724304**

Subject Name: **Marine Geotechnics (Major Elective II)**

1.	Wave Mechanics: Wave generation process, small and finite amplitude wave theories.
2.	Wind forces: Wave forces on vertical, inclined cylinders, structures – current forces and use of Morison equation.
3.	Different types of offshore structures, foundation modeling, structural modeling, Static method of analysis, Foundation analysis, Dynamics analysis of offshore structures, Design of platforms, Jacket tower and mooring cables and pipe lines.

Reference Books:

1. Hydrodynamics of Offshore Structures - Chakrabarti, S.K. Computational Mechanics Publications, 1987.
2. Offshore Structural Engineering - Thomas H. Dawson, Prentice Hall Inc Englewood Cliffs, N.J. 1983
3. Recommended Practice for Planning, Designing - API, American Petroleum Institute and Constructing Fixed Offshore Platforms Dalls, Tex. Publication, RP2A,
4. Oceanographical Engineering - Wiegel, R.L., Prentice Hall Inc, Englewood Cliffs, N.J. 1964.
5. Dynamic Analysis of Offshore Structures, - Brebia, C.A.Walker, S., New-nes Butterworths, U.K. 1979.
6. Offshore Structures, Vol.1, - Reddy, D.V. and Arockiasamy, M.,Krieger Publishing Company, Malabar, Florida, 1991.

GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering (Civil – Geotechnical Engineering)

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Subject Code: **1724305**

Subject Name: **Earth and Rockfill Dams (Major Elective III)**

1.	Site investigation: selection of basic dam section, construction materials, construction technique. Design of earth dam; stability analysis for various conditions, design of filters slope protections, relief well and upstream blanket, quality control, foundation treatment methods, Instrumentation in dam section, monitoring of dam, failure of dam, special problems pertains to foundation treatment, construction and design case studies.
2.	Rockfill dams: Design details and modern construction techniques of rockfill dam, special problems, settlement, core and transition zone, limitations of laboratory parameters evaluations, quality control, earth pressure problems at interface of earth fills and abutments, rockfill and spillway operation, maintenance and safety of dams, routing of floods, gate operation.

Reference books:

1. L. Earth and Rockfill Dam, Wiley, 1967.
2. Creager W. P. Engineering for dams, Wiley, 1967.
3. Singh, B. Earth and Rockfill dam, Sarita Prakashan, 1973.
4. Sowers G. I. Earth and Rockfill dam engineering, A. Earth Manual, USBR Publication.
5. Arcold - Volume on earth and rockfill dams.
6. Mistry J. F., Dams and Appurtenant Works (Imp. Aspects of River valley projects), Mahajan Book Dist., 1998.
7. Sharma H. D., Embankment Dams, Oxford and IBH Pub., 1991.
8. Design of Small Dams, USDI, Oxford and IBH, 1976.

GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering (Civil – Geotechnical Engineering)

Semester – II

Subject Code: **1724306**

Subject Name: **Machine Foundations Design (Major Elective III)**

Design criteria. Degrees of freedom, Foundations for reciprocating machines, Block foundations, Elastic half space theory, Lumped parameter analog model, Foundations for high speed machinery, Dynamic soil structure interaction.

Reference Books::

1. Das B M, “Fundamental of Soil Dynamics”, Elsevier Scientific Publishing Co., New York, 1983
2. Barkan D D, “Dynamics of Bases of Foundations”, McGraw Hill Book Co. Inc., New York
3. Srinivashula P & Vaidyanathan C V, Handbook of “Machine Foundation”, McGraw Hill, 1986
4. Prakash S & Puri V K, “Foundations for Machines”, McGraw Hill, 1987
5. Bykhovsky I, “Fundamentals of vibration engineering “
6. Winterkorn Hans, Fang Hsai Yang, “Foundation Engg Handbook “, Galgottia Publications

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Master of Engineering (Civil – Geotechnical Engineering)

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Subject Code: **1724307**

Subject Name: **Elements of Machine Foundations (Inter Disciplinary Elective II)**

1.	Introduction -nature of dynamics loads -free vibrations of spring mass systems -forced vibrations -viscous damping -principles of vibration measuring equipments
2.	Dynamic stress -deformation and strength of soils -dynamic bearing capacity and earth pressure -Effect of transient and pulsating loads - resonant column apparatus -field tests -typical values of soil constants
3.	Liquefaction of soils -factors influencing -liquefaction potential -analysis from standard penetration data
4.	Machine foundations -design criteria -degrees of freedom -foundations for reciprocating machines -block foundations -elastic half space theory- lumped parameter analog model- foundations for high speed machinery- dynamic soil structure interaction
5.	Vibration isolation -passive and active isolation -use of springs and damping materials -construction aspects of machine foundations

Reference Books:

1. Das B M, "Fundamental of Soil Dynamics", Elsevier Scientific Publishing Co., New York, 1983
2. Barkan D D, "Dynamics of Bases of Foundations", McGraw Hill Book Co. Inc., New York
3. Srinivashulu P & Vaidyanathan C V, Handbook of "Machine Foundation", McGraw Hill, 1986
4. Prakash S & Puri V K, "Foundations for Machines", McGraw Hill, 1987
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Subject Code : **1724308**

Subject Name: **Geotechnical Engineering Software Lab: 2**

1.	Programming: Analysis, design and other geotechnical engineering applications using Visual C. Basic concepts of Expert System, Genetic Algorithms, Artificial Intelligence, Artificial Neural Network & their scope in geotechnical engineering.
2.	Software Usage: FEM Modeling and analysis using professional software like ANSYS, Etabs, SAP etc., Applications of STAAD, STRAP, STRUDS, RISA 3D FEAPpv, TALREN, Sage – CRISP, SIGMA/W, GEO 4 and GEOFEM, PLAXIS.

Reference Books :

1. Programming in C++ - E. Balaguruswamy
2. Teach yourself C++ - Herbert Schildt
3. Object oriented programming in Turbo C++ - Robert Lafore
4. Introduction to Computer Aided Drafting - Voisinet
5. Computer programming and engineering analysis - Syal & Gupta