PG Program [M. Tech. Geotechnical Engineering] Curriculum Structure
W.e.f AY 2019-20 and Applicable for batches admitted from AY 2019-20 to 2022-23

List of Abbreviations

Abbreviation	Title	No of courses	Credits	% of Credits
PSMC	Program Specific Mathematics Course	1	4	5.9%
PSBC	Program Specific Bridge Course	1	3	4.4%
DEC	Department Elective Course	3	9	13.2%
MLC	Mandatory Learning Course	2	0	0%
PCC	Program Core Course	6	22	32.4%
LC	Laboratory Course	2	2	2.9%
IOC	Interdisciplinary Open Course	1	3	4.4%
LLC	Liberal Learning Course	1	1	1.5%
SLC	Self Learning Course	2	6	8.8%
SBC	Skill Based Course	2	18	26.5%

M. Tech. Geotechnical Engineering

Semester I

Sr. No.	Course Type	Course Code	Course Name	Teaching Scheme			Credits
				L	T	P	
1.	PSMC	CGE-19001	Computational Methods in Geotechnical Engineering	3	1	--	4
2.	PSBC	CGE-19002	Analysis and Design of Foundations	3	0	--	3
3.	DEC	CGE(DE)-19001 CGE(DE)-19002 CGE(DE)-19003 CGE(DE)-19004 CGE(DE)-19005	**Department Elective –I** 1. Rock Mechanics 2. Ground Improvement 3. Reinforced Earth and Slopes 4. Environmental Geotechnology 5. Pavement Analysis and Design	3	--	--	3
4.	PCC	CGE-19003	FEM in Geomechanics	3	0	--	3
5.	PCC	CGE-19004	Soil Engineering	3	0	--	3
6.	PCC	CGE-19005	Earth & Rockfill Dam and Slope Stability	3	0	--	3
7.	LC	CGE-19006	Geotechnical Engineering Lab Practice-I	0	0	4	2
8.	LC	CGE-19007	Seminar	2	0	--	1
Total Credits							**22**

Semester II

Sr. No.	Course Type	Course Code	Course Name	Teaching Scheme			Credits
				L	T	P	
1.	IOC		**Interdisciplinary Open Course**	3	--	--	3
2.	DEC	CGE(DE)-19006 CGE(DE)-19007 CGE(DE)-19008 CGE(DE)-19009 CGE(DE)-19010	**Department Elective –II** 1. Centrifuge Modeling 2. Critical State Soil Mechanics 3. Geotechnical Exploration & Instrumentations 4. Applications of Geosynthetics in Geotechnical engineering 5. Offshore Geotechnical Engineering	3	--	--	3
3.	DEC	CGE(DE)-19012 CGE(DE)-19013 CGE(DE)-19014 CGE(DE)-19015 CGE(DE)-19011	**Department Elective –III** 1. Geotechnical Eathquake Engineering 2. Software Applications in Geotechnical Engineering 3. Geotechnical Engineering for Underground Structures 4. Forensic Geotechnical Engineering 5. Geophysical Exploration Methods	3	--	--	3
4.	LLC	LL-19001	Liberal Learning Course	--	--	--	1
5.	MLC	ML-19011	Research Methodology and Intellectual Property Rights	2	--	--	--
6.	MLC	ML-19012	Effective Technical Communication	1	--	--	--
7.	PCC	CGE-19008	Retaining Structures	3	0	0	3
8.	PCC	CGE-19009	Soil Dynamics and Machine foundations	3	0	0	3
9.	PCC	CGE-19010	Soil Structure Interaction	3	0	0	3
10.	LC	CGE-19011	Mini Project	0	0	2	1
11.	LC	CGE-19012	Geotechnical Engineering Lab Practice-II	0	0	4	2
Total Credits							**22**

Dept offers **"**Solid waste management technologies" IOC for students of other departments.

Semester-III

Sr. No.	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	SBC	Dissertation Phase – I	--	--	18	9
2.	SLC	Massive Open Online Course -I	3	--	--	3
		Total Credits				**12**

Semester-IV

Sr. No.	Course Code	Course Name	Teaching Scheme			Credits
			L	T	P	
1.	SBC	Dissertation Phase – II	--	--	18	9
2.	SLC	Massive Open Online Course -II	3	--	--	3
		Total Credits				**12**

Massive Open Online Course –I and II: New Courses (i.e. which has not been learnt earlier and not going to be learnt in next semester)

GEOTECHNICAL ENGINEERING

(PSMC) CGE-19001 Computational Methods in Geotechnical Engineering

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcomes

At the end of the course, Students will be able to

1. Know and recall the core knowledge of the syllabus.
2. Understand the concept. (To measure this outcome, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.)
3. Analyze the problem and apply the appropriate concept.

Course Content

Roots of Equations: Bracketing methods, open methods and case studies. Linear Algebraic Equations: Gauss Elimination, LU decomposition and matrix inversion, special matrices and Gauss-Seidel method, case studies. Numerical Differentiation and Integration: Newton-Cotes integration formulas, integration of equations, numerical differentiation, case studies. Ordinary Differential Equations: Runge-Kutta methods, stiffness and multistep methods, boundary value and eigen value problems, case studies. Partial Differential Equations: Finite difference methods for elliptic and parabolic equations, case studies.

References

1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, Inc., 8th edition 2010.
2. Higher Engineering Mathematics by H K Dass, S Chand & Co. Ltd.,15th edition 2006.
3. Higher Engineering Mathematics by Dr B S Grewal, Khanna Publication, 40th edition 2007.
4. Introductory Methods in Numerical Analysis by S SSastry,PHI,Latest Edition.
5. Applied Numerical Methods using MATLAB for Engineers and Scientists by Steven C. Chapra McGraw-Hill (Indian edition), 3rd edition 2012.

(PSBC) CGE-19002 Analysis and Design of Foundations

Teaching Scheme
Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme
Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcomes

At the end of the course, Student will be able to

1. Know various field test method and soil exploration methods.
2. Know various foundation instrumentation.
3. Suggest various bearing capacity determination technique and settlement analysis and design shallow foundation.
4. Design deep foundation.
5. Design shallow and deep foundation for inclined load and moment and uplift load.

Course Content

Geotechnical Exploration–Penetration Tests, plate load test, field vane shear, large box shear, pressure meter test, foundation instrumentation – settlement and displacement gauges. Shallow Foundation: Bearing capacity & settlement analysis, Design for shallow Foundation under vertical, horizontal and moment loading in sandy and in clayey soil, Raft in sand and clay, Pile Foundation – pile capacity and settlement analysis for individual and group piles in sandy and in clayey soil, pile load test, Foundation under Uplift Loads, negative skin friction, Foundations on rocky strata.

Note – Actual foundation design problems will be covered during tutorial classes.

References

1. Foundation Engineering Hand book, Winterkorn& Fang
2. Analysis & Design of Pile Foundation, Polous& Davis
3. Foundation Design Manual, N.V. Nayak
4. Foundation Analysis and Design- Joseph E. Bowels, TATA Mc-Grawhill
5. Design Aids in Soil Mechanics and Foundation Engineerimg, Shenbage R Kaniraj, TATA Mc-Grawhill
6. Design of Foundation Systems, Nainan P Kurian, Narosa publication house
7. Foundation Design & Construction, M.J.Tomlinson, ELBS publication
8. Foundation Engineering Hand book, Hsai-Yang-Fang, Chapman & hall, New York.
9. Foundaton Engineering-Nitin Som
10. Advanced Foundation Engineering-B.M.Das
11. Poulos, H. G. (2016). Tall building foundations: design methods and applications. Innovative Infrastructure Solutions, 1(1), 10.

(DEC) CGE (DE)-19001 Rock Mechanics

Teaching Scheme
Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme
Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcomes

At the end of the course, student will be able to

1. Independently suggest the best suitable method of rock exploration based on site visit.
2. Suggest and provide best possible solution for rock stability.

General, classification of genesis, lithological, Methods of exploration, direct penetration, geophysical, Theory, procedure, instruments, limitations and interpretation, In-situ test, necessity, types, Failure theories , deformability tests, shear strength tests, dilatometer, stress relief, flat jack –techniques., Physical and mechanical tests, types, permeability, electrical properties, thermal properties, durability, strength tests, elasticity constant tests, hardness., Rock testing: samples, specimens, compression, tension, shear test ,shear strength properties, RMR, Creep phenomenon, simple and complex rheological models-purpose, idealization and applications. Shear strength of rock under high pressure, stability of rock slopes, anisotropic rock system, lateral pressure on retaining structures for high hill slopes, bearing capacity of rock masses, opening in rocks, lined and unlined tunnels.

References:

1. Fundamentals of Rock Mechanics, Jaeger, J.C., Cook, N.G.W., Zimmerman, R.W., 4th Edition, Blacmwell Publishing.
2. Experimental Rock Mechanics, Mogi Kiyoo, Taylor & Francis.
3. Engineering Rock Mechanics – An Introduction to Principles, Hudson, J.A. and Harrison, J.P., Pergamon.
4. Rock Mechanics and Design of Structures, Obert and Duvall, John Willey & Sons.
5. Rock Mechanics in Engineering Practice, Stag and Zienkiewez, John Willey & Sons
6. Engineering in Rocks, T. Ramamurthy, PHI Learning Pvt. Ltd.

(DEC) CGE (DE)-19002 Ground Improvement

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcomes

At the end of the course, Students will be able to

1. Independently design and suggest a suitable ground improvement technique for a given site where he should have prerequisite knowledge of soil properties, various laboratory and field tests and IS codes.

Course Content

Principles of compaction, Laboratory compaction, Engineering behaviour of compacted clays, field compaction techniques- static, vibratory, impact, Earth moving machinery, Compaction control, Dynamic compaction, Shallow Stabilization with additives: Lime, flyash, cement and other chemicals and bitumen, in-situ soil mixing; Deep Stabilization-lime column, soil-lime column; Grouting: permeation, compaction and jet; sand column, stone column, Vibro-floatation, sand drains, prefabricated drains, electro-osmosis; thermal, freezing. Dewatering systems, Design of ground improvement system using stone columns, prefabricated drains and geosynthetics.

References

1. Ground Imrovement by M.P.Mosely, CRC Press, Inc.
2. Winterkorn& Fang- Foundation Engineering Hand book
3. K.B. Woods, D.S. Berry and W.H. Goetz, Highway Engineering Handbook, 1960.
4. IS code for stone column and prefabricated drains
5. Foundation Engineering Manual-N.V. Nayak
6. Koerner, R. M.: Designing with Geosynthetics, Prentice Hall, NJ

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(DEC) CGE (DE)-19003 Reinforced Earth and Slopes

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcomes

At the end of the course, Student will be able to

1. Understand various types of geosynthetic materials, there properties and applications.
2. Understand about the laboratory testing required for the assessment of the properties of the geosynthetic materials.
3. Design simple RE walls and RE slopes using BS and FHWA codes.
4. Design simple RE slopes using BS code.

Course Content

History and development of earth reinforcement, Bar mesh and welded wire mesh as reinforcement, Natural fibers, Reinforced soil structures: principles of soil reinforcement, Reinforced soil walls and slopes, design of RS walls and RS slopes using BS and FHWA codes, Design of Gabions, Properties of Geotextiles, Geomembranes, Geogrids, Geocomposite, Design strength of geotextiles and Geogrids, testing on Geotextiles, and Geogrids.

Reference:

1. Swami Saran “Reinforced Soil & its Engineering Applications”.
2. R. A. Jewel: Soil Reinforcement with Geotextiles, Construction Industry Research & Information Association (CIRIA) Thomas Telford.
3. Engineering with Geosynthetics: ed. G. Venkatappa Rao, GVS Suryanarayana Raju, Tata McGraw Hill Publishing Co. Ltd.
4. ASTM and Indian Standards on Geotextiles.
5. Koerner, R. M.: Designing with Geosynthetics, Prentice Hall, NJ.
6. Jones, C.J.E.P. Reinforcement and soil structures, Butter worth Publications.
7. BS 8006:1995, “Code of practice for strengthened/reinforced soils and other fills”.
8. FHWA-NH1-00-043, “Mechanically stabilized earth walls and reinforced soil slopes design and construction guidelines”.

(DEC) CGE (DE)-19004 Environmental Geotechnology

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

At the end of the course, Students will be able to

1. Understand the need for the solid waste management.
2. Understand about the waste management and planning issues.
3. Understand how engineered landfills helps in management of solid waste.
4. Understand about the requirements of various components of engineered landfills and will be able to analyze the liner stability problems.

Course content

Introduction: Scope, role of Geotechnical engineering. in environmental protection , geomorphologic principles relating to laterites and pedagogical changes, Climate and soil, Type of Wastes, Surface and sub surface contamination, Pollutant transport in porous media, Design and construction of landfills for municipal and hazardous wastes, Liners : Basic concepts, design and construction , liner stability , compatibility, performance, Modification / Improvement in soil structure , Reuse: Geotechnical reuse of waste material , waste management and planning issues, Regulations, special applications and case studies.

References

1. Daniel, D.E. Geotechnical practice for waste disposal, Chapman and Hall, London.
2. Kays, W.B. Construction of Linings for reservoirs, Tanks and Pollution control facilities.
3. Sincero and sincero. Environmental Engineering: A Design Approach, Prentice Hall of India (P) Ltd. New Delhi.
4. Hsai-Yang Fang, Introduction to Environmental Geotechnology, CRC Press.
5. Geoenvironment 2000: Characterization, Contain in Environmental Geotechnics, ASCE, Geotechnical special Publication no. 46, vol. I and II NY, 1995.
6. Geoenvironmental Engineering- Principles & Applications by Lakshmi N. Reddi & Hillary I. Inyang.
7. Geoenvironmental Engineering by Hari D. Sharma & Krishna R. Reddy.
8. Guidelines of CPCB (Central Pollution Control Board)-Landfills.

(DEC) CGE (DE)-19005 Pavement Analysis and Design

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

At the end of the course, Students will able to

1. Evaluate stresses and strains for various loading and environmental conditions for flexible and rigid pavements.
2. Design flexible and rigid pavements.
3. Analyze and evaluate pavement distresses and select best suited rehabilitation techniques.
4. Design reinforced flexible pavement.

Theories of pavement design, Factors affecting pavement design, Methods of flexible pavement design- applications of CBR, Burmister, Asphalt Institute, AASHTO and IRC methods, Load and temperature stresses in rigid pavements- Westergaard's, Bradburry's and Picket's concepts, Design of rigid pavements by PCA, AASHTO and IRC methods, Design of joints in rigid pavements, Evaluation of pavement distress, Design aspects of flexible and rigid overlays, Rehabilitations Techniques – Reflective Cracking, Reinforced Overlays, Ultra-Thin White Topping, IRC 37.

References

1. Yoder and Witzack, Principles of Pavement Design, John Willey and Sons, October 1975
2. Yang H. Huang, Pavement Analysis and Design, PH,2nd Edition, 2004, RILIM Conference Proceedings
3. IRC-37
4. FHWA for Pavement Design.

(PCC) CGE-19003 Finite Element Methods in Geomechanics

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcomes

At the end of the course, Student will be able to

1. Use of FEM for solving geotechnical problems.
2. Adopt a suitable constitutive model.
3. Apply this technique for the solution of stress-strain, seepage problems which are widely encountered in geotechnical engineering.
4. Identify the proper technique for solution of the problem in field and then obtain the solution to the same.

Course Content

Basic equation from solid mechanics, FEM procedure, Types of elements, Shape function, Element properties, Natural Coordinates, Isoperimetric element and Constitutive models for soils, Introduction to techniques for non-linear analysis, Application of FEM to problems such as seepage/consolidation/earth dams.

References:

1. Finite Element Analysis in geotechnical engineering – Theory, David M. Potts and LidijaZdravkovic.
2. Finite Element Analysis in geotechnical engineering – Applications, David M. Potts and LidijaZdravkovic.
3. Finite Element in geotechnical engineering, Naylor, Pande and Simpson.
4. Introduction to FEM, A numerical method for Engineering analysis, Desai C.S. and Abel J.F., East West Edition, 1972.
5. Programming FEM with applications to Geomechanics, Smith I.M, John Wiley and son, 1982.
6. Basic principles of the finite element methods-K.M.Entwistle.
7. Finite Element Methods, Zienkiewicz O.C. and Taylor R.L.,McGrawhill,1991.

(PCC) CGE-19004 Soil Engineering

Teaching Scheme
Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme
Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

At the end of the course, Students will able to

1. Judge physical, chemical and engineering properties of soils based on formation processes history, minerals and soil structure.
2. Students will able to collect undisturbed soil samples and plan lab tests for engineering characteristics of soil.
3. Conduct consolidation test and analyze the data.
4. Select and use state of the art instruments and data acquisition system.

Course content

Introduction to Soils, Formation of soils, complexity of soils nature, typical engineering behavior of soils of India, Soil structure: Types of bonds, important clay minerals, DDL theory, The soil drainage, soil temperature, & control, The soil reaction, soil acidity and alkalinity, the buffering of soils, physical properties of soil in relation to tillage and erosion, soil water potential, X-ray and Differential Thermal Analysis; structure of coarse grained soil, behavior of granular and cohesive soils with respect to their water content ; Consolidation: Steady State flow, 2D and 3D seepage, transient flow; Compressibility and rate of consolidation, one, two, and three dimensional consolidation theories; Sand drains ; Elastic methods of stress distribution in soils, Shear strength behavior of sand and clay, shear strength parameters to be used under different field loading and drainage conditions, Rheology.

References:

1. Physical & geotechnical properties of soils – Joseph E.Bowels, Tata Mc.- Grawhill.
2. Advanced soil mechanics- BrajaM.Das, Tata Mc.- Grawhill.
3. Principles of Soil Mechanics, R F Scott, Addison & Wesley.
4. Mitchell, James K, Fundamentals of Soil Behaviour, John Wiley and Sons.
5. Soil physics by Baver.
6. Soil Physics by Ghidyal&Tripathi, New Age International Publishers.
7. Clay Mineralogy by Harr.

(PCC) CGE-19005 Earth & Rockfill Dam and Slope Stability

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

At the end of the course, Students will be able to

1. Identify type of earthen dam.
2. Identify different types of soil for construction of earthen dam.
3. Understand the stability analysis.
4. Design earthen dam.
5. Identify various forces acting on the retaining wall and design retaining wall and cofferdam

Course Content

Embankment dams –causes of failures and criteria for safe design, seepage through dams, Casagrande's solution, Kozeny's parabola, entrance and exit correction, electrical resistivity to assess seepage, flow nets and applications, Control of seepage through dams and foundations, filters, drains, rock-toe and relief wells. Stability analysis – steady seepage and sudden draw down condition, seismic stability, Pore pressure role in stability analysis, Earth Pressure Theories, Failure modes of gravity and flexible retaining walls, design of gravity and rigid cantilever retaining wall, Design of flexible retaining wall – cantilever and anchored, Coffer Dam. Methods of slope stability.

References:

1. Christian Kutzner, "Earth & Rock fill dams – Principles of design and construction", Published Oxford and IBH.
2. USIBR, "Design of small dams"Oxford and IBH Publishing Company.
3. USIBR, "Earth Manual", CBS Publishers and distributors.
4. E. N. Bromhead, "The stability of slopes", Blackie Academic and Professional
5. C.R.I. Clayton, J. Milititsky, Ufrgs and R.I. Woods, "Earth pressure and Earth Retaining structures", Blackie Academic and Professional
6. Sherad, "Earth and Rock fill dams".
7. Bharat Singh, "Earth and Rock fill dams".
8. Winterkorn and Fang, "Foundation Engineering Hand Book".

(LC) CGE-19006 Geotechnical Laboratory Practice-I

Teaching Scheme:
Practical: 4 Hrs/week

Examination Scheme:
Team Work: 50 Marks
Oral: 50 Marks

Course outcomes

At the end of the course, Students will be able to

1. Perform and interpret the laboratory experiments such as Hydrometer Test, Consolidation Test, Swelling Pressure Test, Triaxial Test with Measurement of Pore Pressure
2. Use a suitable computer software for analysis and design of geotechnical problems

Course Content

1) Laboratory tests **(Any three)**
   Hydrometer Analysis, Consolidation Test, Swelling Pressure Test, Triaxial Test with Measurement of Pore Pressure, Types of samplers.
2) Assignments **(Any Two)** on use of a suitable computer software for analysis and design of substructure, stability of slopes, Seepage Analysis, retaining structure.

Reference:

1. SP 36 (Part I) 1987 Compendium of Indian Standards on Soil Engineering: Part I Laboratory testing of soils for civil engineering purposes.

(LC) CGE-19007 Seminar

Teaching Scheme
Lectures: 2 hrs/week

Examination Scheme
End-Sem Exam : 100 marks

Course outcome

At the end of the course, students will demonstrate the ability to

1. Identify a topic for study and carry out literature survey
2. Write a technical report related to selected topic
3. Present outcome of the study with the help of ppt.

Course Content

Seminar is to be performed and reported by the end of the first semester.

(IOC) GE-XYZ Solid Waste Management and Technologies

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes:

1. Student will be able to understand municipal solid waste management systems with respect to its physical properties, and associated critical considerations in view of emerging technologies
2. Student will be able to know sources, types and composition of solid waste with methods of handling, sampling and storage of solid waste.
3. Student will be able to select the appropriate method for solid waste collection, transportation, redistribution and disposal.
4. Student will be able to describe methods of disposal of hazardous solid waste.

Course Content

Solid Waste analysis and characterization, Hazardous waste Characterization Environmental legislation for solid and hazardous waste disposal and transport Risk Assessment, Waste minimization and resource recovery, Waste stabilization techniques, Chemical, physical and biological treatment Landfill design for Sanitary and Hazardous Wastes, Incineration.

References:

1. Tchobanoglous, G., Theisen, H., Vigil, S. A., & Alaniz, V. M. (1993). Integrated solid waste management: engineering principles and management issues (Vol. 4). McGraw-Hill New York.
2. Henstock, M. E. (1983). Disposal and recovery of municipal solid waste.
3. Ahsan, N. (1999). Solid waste management plan for Indian megacities. Indian Journal of Environmental Protection, 19, 90–95.
4. Davis, M. L., & Masten, S. J. (2004). Principles of environmental engineering and science. McGraw-Hill New York.

(DEC) CGE(DE)-19006 Centrifuge Modeling

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes:

1. Students will be able to understand various types of modeling techniques such as physical and numerical, for solving the problems of geotechnical engineering.
2. Students will be able to understand the concept of centrifuge modeling.
3. Students will be able to understand the application of dimensional analysis in centrifuge modeling such as similarity laws and scale effects.
4. Students will be able to understand the utility of the centrifuge modeling techniques for solving geotechnical problems related to static, dynamic, seepage and consolidation cases.

Course Content

Modeling, Physical and numerical modeling, Types of physical modeling: 1-g and N-g modeling, Concept of centrifuge modeling, Application of dimensional analysis in centrifuge modeling, similarity laws, scale effect, application of centrifuge modeling for static and dynamic geotechnical problems, seepage and consolidation problems, case studies

Reference:

1. R. N. Taylor, “Geotechnical centrifuge technology” Blackie Academic and Professional-an imprint of Chapman and Hall, UK (1995)
2. Wood, D. M. (2014). Geotechnical modelling. CRC press.

(DEC) CGE(DE)-19007 Critical State Soil Mechanics

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes:

1. Students will able to plot stress paths under various drainage conditions.
2. Students will able to evaluate critical state soil parameters under various drainage conditions.
3. Students will able to analyze and evaluate elastic and plastic properties of soils.
4. Students will able to develop constitutive relationships for soils.
5. Students will able to select and implement soil stabilization techniques based on field conditions.

Course Content

Critical state soil mechanics: Critical State Line, Hvorslev Surface, Yield Surfaces: Modified Cam-clay and Original Cam-clay; Elastic and plastic analysis of soil: Constitutive relationships of soil; failure theories. Limit analysis-Upper bound theorems, lower bound theorems, limit equilibrium methods.

References:

1. Advanced soil mechanics- BrajaM.Das, Tata Mc. - Grawhill.
2. Principles of Soil Mechanics, R F Scott, Addison & Wesley.
3. Fundamentals of Soil Behaviour, Mitchell, James K,John Wiley and Sons.
4. Elasticity and Geomechanics, R.O. Davis and A.P.S. Selvadurai, Cambridge University Press, New York.
5. Soil Behaviour and Critical State Soil Mechanics, D.M. Wood, University of Glasgow.
6. The Mechanics of Soil – J.H. Atkinson.
7. Critical State Soil Mechanics-A.Scdofield, P.Wroth.
8. Limit Analysis- W.F.Chen.
9. Applied Analysis in Geotechnics-FethiAzizi.

(DEC) CGE(DE)-19008 Geotechnical Exploration & Instrumentations

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

1. Students will be able to know about the various subsoil exploration methods and its suitability for the specific site.
2. Students will be able to evaluate subsoil properties for various civil engineering projects.
3. Students will be able to know the principles and working of various instrumentations required for finding different geotechnical parameters.

Course Content

Introduction: Data required for soil investigation, Methods of Exploration - Planning the Exploration Program, Sampling and Programme: Soil Boring, Soil Samplers and Sampling, Underwater Sampling Groundwater Table (GWT) Location, Number and Depth of Borings. Drilling and/or Exploration of Closed Landfills or Hazardous Waste Sites, Preparation of Soil Report, Penetration Tests: Standard Penetration Test - SPT Correlations, Design N Values – Cone Penetration Tests, Field Vane Shear Testing, Borehole Shear Test, Flat Dilatometer Test, Pressuremeter Test, Rocks: Rock Sampling, RQD, Strength and modulus from classifications, Classification based on strength & modulus and strength and fracture strain, Geoengineering classification, Instrumentation - pore pressure measurement, earth pressure cell, settlement gauges. Inclinometers, Stress measurements, Seismic measurements.

References:

1. Bowles, J. E. - Foundation Analysis & Design 7th Edition McGraw-Hill Companies, Inc. (1996)
2. Das, B. M. - Principles of Foundation Engineering 9th Edition Nelson Engineering (2004)
3. Donald P Coduto – Foundation Design Principles and Practices, 3rd edition, Pearson, Indian edition, 2012.
4. Goodman – Introduction to Rock mechanics, Willey International (1980).
5. Geotechnical Investigation Methods: A Field Guide for Geotechnical Engineers. EHUNT, Taylor & Francis, .2006.
6. Handbook of Geotechnical Investigation and Design Tables, Routledge, (2007).

(DEC) CGE(DE)-19009 Applications of Geosynthetics in Geotechnical Engineering

Teaching Scheme
Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme
Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

1. Student will be able to understand basic concepts of using geosynthetics for ground improvement and containment purpose.

Course Content

Geosynthetics: types and functions, properties of geo-synthetics, materials and manufacturing processes, testing and evaluation, application of geotextiles and geogrids in roads, walls, and embankments. Application of geotextiles, geonets and geocomposites as drains and filters. Multiple functions: railways and overlay design. Geosynthetics in environmental control: covers and liners for landfills, material aspects and stability considerations, applications of geo-synthetics in bearing capacity improvement, slope stability, retaining walls, embankments on soft soil, and pavements, filtration, drainage and seepage control with geo-synthetics, geo-synthetics in landfills, soil nailing and other applications of geosynthetics.

References

1. Hausmann, M.R., Engineering Principles of Ground Modification, McGraw-Hill, 1990.
2. Jones, C.J.E.P., Reinforcement and Soil Structures, Butterworth Publications, 1996.
3. Koerner, R. M., Designing with Geosynthetics, Prentice Hall Inc. 1998.

(DEC) CGE(DE)-19010 Offshore Geotechnical Engineering

Teaching Scheme
Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme
Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

1. Student will be able to understand differences between the soil and loading conditions of on-shore and offshore structures.
2. Student will be able to know various types of offshore foundation systems.
3. Student will be able to evaluate the performance of offshore structures.

Course Content

The nature of Submarine Soils: origin, classification and distribution of marine sediments; Offshore Geotechnical Investigations: Foundations for Offshore foundations types and design, seabed anchors, Offshore Pile Foundations, Seafloor Stability, slope stability under gravity forces and wave forces, Effects of soil instability on piles

References

1. Marine Geotechnics – H.G. Poulos (1988), Prentice Hall Inc.
2. Construction of marine and offshore structures – Ben C Gerwick, jr., CRC Press, Taylor and Francis Group. (2012).
3. Seabed Reconnaissance and Offshore Soil Mechanics (for the installation of petroleum structures) – Pierre LE Tirant (1979), Gulf Publishing Company, Houston, Texas.
4. API (2000) – Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms – API, RP2A.
5. Pile design and construction practice – M J Tomlinson, View point Publications, Palladian Publications Limited. (1987).

(DEC) CGE(DE)-19012 Geotechnical Earthquake Engineering

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

1. Students will be capable of understanding the strong ground motion characteristics and will be able to collect and analyze the pertaining data.
2. Students will able to obtain the response in terms of the requisite spectra by idealization of the system into elastic, inelastic, discrete or continuous system.
3. Students will able to identify the sites prone to liquefaction using various approaches.
4. Students will be capable of understanding the behavior of geotechnical structures gravity dam and retaining wall subjected to earthquake.

Course Content

Earthquake occurrence in India, Seismic zoning map of India, strong motion measurements in earthquake engineering, Characterization of ground motion, Earthquake spectra for elastic and inelastic systems, Vibration of single, multiple DOF and continuous system, Liquefaction of sands due to earthquake., Behavior of retaining walls during earthquakes, Dynamic behavior of gravity dams/pile foundations, Review of damages during past earthquakes and remedial measures.

References

1. Wiegel R.L., “Earthquake Engineering”, Prentice Hall, 2nd Ed, 1989.
2. Jai Krishna and A.R. Cahndrasekaran, “Elements of Earthquake Engineering”.

3. Arya, Shamsher Prakash, Srivastava L.S., Brijesh Chandra, “Earthquake Engineering”
4. Kamleshkumar- “Basic Geotechnical Earthquake Engineering” New Edge Publication
5. Steven Kramer- “Geotechnical Earthquake Engineering”,ISBN Publication, Low price edition.
6. Relevant Codes-IS 1893, IRC 6.
7. FHWA code guidelines for geotechnical structures.

(DEC) CGE(DE)-19013 Software Applications in Geotechnical Engineering

Teaching Scheme
Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme
Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

1. Students will be able to understand and adopt suitable constitutive model.
2. Students will be familiar with the use of different software for solving geotechnical problems.

Course Content

Introduction to modeling, Constitutive models (elasticity, ideal plasticity, Mohr-Coulomb model, plasticity with hardening). FEM Analysis of simple Geotechnical Problems using PLAXIS Software. Theory and modeling of shallow foundations, deep foundations, retaining walls, reinforcement structures, embankments and cuttings, and underground structures. Different geotechnical engineering softwares viz. GEO5, GEOSLOPE, MIDAS etc.

References

1. Neural Networks,Fuzzy Logic and Genetic Algorithm - Synthesis and Applications- Rajasekaran S., Vijaylakshmi and Pai G.A, PHI Learning Private Limited.
2. Manuals of GEO5, PLAXIS, GEOSLOPE, MIDAS, midas SOILWORKS.

(DEC) CGE(DE)-19014 Geotechnical Engineering for Underground Structure

Teaching Scheme
Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme
Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

1. Students will be able to acquire knowledge in the design and construction of underground line structures in soil and rocks.

Course Content

Underground structures - types, specific requirements for investigation, construction methods. Geotechnical survey and classification of rock mass for construction of underground structures, Geotechnical monitoring during excavations, technology of the construction of underground line structures in soil and rocks, principles of the maintenance, repair and reconstruction of underground structures.

References

1. Sinha, R. S. (2012). Underground structures: design and instrumentation. Elsevier.

(DEC) CGE(DE)-19015 Forensic Geotechnical Engineering

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

1. Student will be able to deal with investigations of soil-interaction related failures of engineered facilities or structures.
2. Student will be able to analyze failures connected with geotechnical and geological origin to improve professional practice, codes of analysis and design as well as practice.

Course Content

Introduction, Types of Damages, Preliminary Information, Accepting Assignment, Planning the Investigations, Site Investigations, Settlement of sub structures, Expansive soils, types of expansive soil movements, Foundation design for expansive soils, lateral movements of soils, Ground water moisture related problems of substructures, Repairs and crack diagnosis.

References

1. Forensic Geotechnical Engineering Developments in Geotechnical Engineering- V.V.S. Rao and G.L. Shivakumar Babu (eds) Springer India
2. Geomechanics of failures- A.M. Puzrin et al, Springer Science + Business Media B.V.2010.

(DEC) CGE(DE)-19011 Geophysical Exploration Methods

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

1. Student will be able to measure the physical properties of the subsurface through these techniques

Course Content

Applications of geophysical methods in Civil Engineering. Electrical resistivity method, Seismic reflection method, Geophysical logging and resistivity logging, Cross hole test, down hole test & up hole test, spectral analysis of surface waves, seismic cone penetration test.

References

1. Kearey, P., Brooks, M., & Hill, I. (2013). An introduction to geophysical exploration. John Wiley & Sons.

(LLC) LL-19001 Liberal Learning

Course Outcomes

At the end of course, Students will be able to
1. Develop capacity to understand multidisciplinary sciences in a friendly manner.
2. Create openness to diversity.
3. Acquire ability to lead and examine life and value the need for life learning.

Course Content

Student will be able to choose and enhance practical learning and application in the subject of his/her choice. One credit course spread over the semester to enhance practical learning and application.

- Agriculture
- Business
- Clay Art & Pottery
- Corporate Culture
- Defense
- French
- Geography
- Holistic Health
- Modern Film Making

- Music (Instrumental)
- Photography
- Political Science
- Music (Vocal)
- Wood and Metal Art
- Japanese
- Painting

(MLC) ML - 19011 Research Methodology

Teaching Scheme
Lectures: 3 hrs/week

Examination Scheme
Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course Outcomes:

At the end of the lab course, the students will demonstrate the ability to:

1. Understand research problem formulation and approaches of investigation of solutions for research problems
2. Learn ethical practices to be followed in research
3. Apply research methodology in case studies
4. Acquire skills required for presentation of research outcomes (report and technical paper writing, presentation etc.)

Syllabus Contents:

Unit 1: (05 Hrs)

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations.

Unit 2: (05 Hrs)

Effective literature studies approaches, analysis

Use Design of Experiments /Taguchi Method to plan a set of experiments or simulations or build prototype

Analyze your results and draw conclusions or Build Prototype, Test and Redesign

Unit 3: (05 Hrs)

Plagiarism, Research ethics

Effective technical writing, how to write report, Paper.

Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

References

1. Willan, Andrew R., and Andrew H. Briggs. Statistical analysis of cost-effectiveness data. Vol. 37. John Wiley & Sons, 2006.
2. Lawless, J.F., 1982, Statistical Models and Methods for Lifetime Data (Wiley: New York).
3. Schneider, H., 1986, Truncated and Censored Samples Normal Populations, (Dekker: New York
4. Burt, Cyril. "Research in education." (1922).
5. Eliot, Simon, and William Robert Owens, eds. A handbook to literary research. Psychology Press, 1998.
6. Intellectual Property in New Technological Age by Robert P. Merges, Peter S. Menell, Mark A. Lemley.

(MLC) ML - 19011- Intellectual Property Rights

Teaching Scheme
Lectures: 1 hr/week

Evaluation Scheme
Continuous evaluation
Assignments/Presentation/Quiz/Test

Course Outcomes (CO):
Student will be able to

1. Infer that tomorrow's world will be ruled by ideas, concept, and creativity.
2. Gather knowledge about Intellectual Property Rights which is important for students of engineering in particular as they are tomorrow's technocrats and creator of new technology.
3. Discover how IPR is regarded as a source of national wealth and mark of an economic leadership in context of global market scenario.
4. Study the national & International IP system.
5. Summarize that it is an incentive for further research work and investment in R & D, leading to creation of new and better products and generation of economic and social benefits.

Unit 1: [03]
Introduction to the concepts Property and Intellectual Property, Nature and Importance of Intellectual Property Rights, Objectives and Importance of understanding Intellectual Property Rights

Unit 2: [07]
Understanding the types of Intellectual Property Rights: -
Patents-Indian Patent Office and its Administration, Administration of Patent System – Patenting under Indian Patent Act, Patent Rights and its Scope, Licensing and transfer of

technology, Patent information and database. Provisional and Non Provisional Patent Application and Specification, Plant Patenting, Idea Patenting,
Integrated Circuits, Industrial Designs, Trademarks (Registered and unregistered trademarks), Copyrights, Traditional Knowledge, Geographical Indications, Trade Secrets, Case Studies
Unit 3: [04]
New Developments in IPR, Process of Patenting and Development: technological research, innovation, patenting, development,
International Scenario: WIPO, TRIPs, Patenting under PCT

Reference Books:

1. Aswani Kumar Bansal : Law of Trademarks in India
2. B L Wadehra : Law Relating to Patents, Trademarks, Copyright,
    a. Designs and Geographical Indications.
3. G.V.G Krishnamurthy : The Law of Trademarks, Copyright, Patents and
    a. Design.
4. Satyawrat Ponkse: The Management of Intellectual Property.
5. S K Roy Chaudhary & H K Saharay : The Law of Trademarks, Copyright, Patents
6. Intellectual Property Rights under WTO by T. Ramappa, S. Chand.
7. Manual of Patent Office Practice and Procedure
8. WIPO : WIPO Guide To Using Patent Information
9. Resisting Intellectual Property by Halbert ,Taylor & Francis
10. Industrial Design by Mayall, Mc Graw Hill
11. Product Design by Niebel, Mc Graw Hill
12. Introduction to Design by Asimov, Prentice Hall
13. Intellectual Property in New Technological Age by Robert P. Merges, Peter S. Menell, Mark A. Lemley

(MLC) ML – 19012 Effective Technical Communication

Teaching Scheme: Lectures: 1hr / week

Evaluation Scheme: 100M: 4 Assignments (25M each)

Course Outcomes (COs):

After successful completion of the course, students will be able -

1. To produce effective dialogue for business related situations
2. To use listening, speaking, reading and writing skills for communication purposes and attempt tasks by using functional grammar and vocabulary effectively
3. To analyze critically different concepts / principles of communication skills
4. To demonstrate productive skills and have a knack for structured conversations
5. To appreciate, analyze, evaluate business reports and research papers

Unit 1: Fundamentals of Communication [4 Hrs]

7 Cs of communication, common errors in English, enriching vocabulary, styles and registers

Unit 2: Aural-Oral Communication [4 Hrs]

The art of listening, stress and intonation, group discussion, oral presentation skills

Unit 3: Reading and Writing [4 Hrs]

Types of reading, effective writing, business correspondence, interpretation of technical reports and research papers

Reference Books

1. Raman Sharma, "Technical Communication", Oxford University Press.
2. Raymond Murphy "Essential English Grammar" (Elementary & Intermediate) Cambridge University Press.
3. Mark Hancock "English Pronunciation in Use" Cambridge University Press.
4. Shirley Taylor, "Model Business Letters, Emails and Other Business Documents" (seventh edition), Prentise Hall
5. Thomas Huckin, Leslie Olsen "Technical writing and Professional Communications for Non-native speakers of English", McGraw Hill.

(PCC) CGE-19008 Retaining Structures

Teaching Scheme
Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme
Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

1. Student will be able to design conventional/Reinforced earth retaining walls, sheet pile walls, bracing system for open excavations.

Course Content

Earth Pressure Theories: Rankine's and Coulomb's Earth pressure theories for cohesive and cohesionless soils, stresses due to compaction and surcharge loads. Conventional Retaining Wall: Types of retaining walls, Stability (sliding, overturning, bearing capacity & overall) of gravity and cantilever walls, Proportioning of retaining walls, Backfill material and drainage. Flexible Walls: Sheet pile walls, Construction methods- Cantilever and Anchored (Free and Fixed support methods) sheet pile walls in coarse and fine grained soils, moment reduction method. Reinforced Soil Walls/Mechanically Stabilized Earth: - Failure mechanisms-bond and rupture failures, Analysis methods, Limit equilibrium method- Internal and external stability, Static analyses. Braced Cuts and Soil Nailing: Lateral earth pressure in braced cuts, Design of various components, Stability of braced cuts, base heave and stability, yielding and settlement of ground surrounding excavation, Diaphragm walls – slurry support; Soil Nailing.

References

1. Das, B. M. - Principles of Foundation Engineering 5th Edition Nelson Engineering (2004)
2. Bowles, J. E. - Foundation Analysis & Design 5th Edition McGraw-Hill Companies, Inc. (1996)
3. Rowe, R. K. - Geotechnical & Geo-environmental Engineering Hand Book –Springer (2001)
4. Hans Friedrich Winterkorn, Hsai-Yang Fang - Foundation Engineering Handbook, Van Nostrand Reinhold, 1975.
5. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

(PCC) CGE-19009 Soil Dynamics and Machine foundations

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

1. Students will be familiar with identification and solution of a particular dynamic system.
2. Students will be capable of analyzing dynamic behavior of soil through wave propagation theory and also be able to determine the dynamic soil properties.
3. Students will able to analyze and carry out the design of machine foundation and will be able to provide appropriate vibration isolation technique if necessary.
4. Students will able to obtain dynamic response of geotechnical structures such as retaining walls and shallow foundations.

Course Content

Theory of vibration, Dynamics Systems, single degree and two degree of freedom system, Wave propagation theory and its application to dynamic problems, Measurement of dynamic soil properties- cyclic plate load, tri-axial tests and seismic refraction, Dynamic earth pressure measurement, displacement of retaining walls, Machine Foundation- Principle& Design of Machine foundation, methods of decreasing vibration in existing foundations.
Note: - In this course all relevant IS codes will be discussed

References

1. Vibration Analysis and Foundation Dynamics by N.S.V, Kameswara Rao, published by Wheeler publishing
2. Analysis and Design of Foundation for Vibration by P.J. Moore published by Oxford and IBH Publishing Company
3. Soil Dynamics and Machine Foundation by Swami Saran published by Galgotia Publication
4. Vibration of Soil and Foundation by F.E. Richart, J.R. Hall and R.D. Woods Published by Prentice-Hal Inc, New Jersy
5. IS: 5249-1969/1975 Method of test for Determination of In situ Dynamic Properties of soils
6. Design of Machine Foundation-Vaidyanathan

(PCC) CGE-19010 Soil Structure Interaction

Teaching Scheme

Lectures: 3 hrs/week
Tutorials: 1 hr/week

Examination Scheme

Test 1 and 2 : 20 marks Each
End-Sem Exam : 60 marks

Course outcomes

1. Students will able to understand concept of nature and complexities of soil structure interaction.
2. Students will able to evaluate soil structure interaction for different types of structure under various conditions of loading and subsoil characteristics.
3. Students will able to prepare comprehensive design oriented computer programs for interaction problems based on theory of subgrade reaction such as beams, footings, rafts etc.
4. Students will able to analyze different types of frame structure founded on stratified natural deposits with linear and non-linear stress strain characteristics.
5. Students will able to evaluate group of action of piles considering stress-strain characteristics of real soils.

Course Content

Critical study of conventional methods of foundation design: nature and complexities of soil structure interaction: application of advanced techniques of analysis such as FEM and finite difference method, Relaxation and interaction for the evaluation of soil structure interaction for different types of structure under various conditions of loading and subsoil characteristics. Preparation of comprehensive design oriented computer programs for specific problems, Interaction problems based on theory of sub grade reaction such as beams, footings, rafts etc. Analysis of different types of frame structure founded on stratified natural deposits with linear and non-linear stress-strain characteristics., Determination of pile capacities and negative skin friction, group of action of piles considering stress-strain characteristics of real soils., Anchor piles and determination of pullout resistance, well foundation

References

1. Bowels J.E.," Analytical and Computer Methods in Foundation", McGraw Hill Book Co. New York. (1974)
2. Desai C.S. and Christian J.T. "Numerical Methods in Geotechnical Engineering" McGraw Hill Book Co. New York.
3. Soil Structure Interaction, The real behavior of structures, Institution of Structural Engineers.
4. Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg.vol-17, Elsevier Scientific Publishing Co.
5. Selvadurai A.P.S. "Elastic Analysis of Soil-Foundation Interaction", Elsevier Scientific Publishing Company.

6. Swami Saran"Analysis& Design of substructures", Oxford &IBH Publishing Co. Pvt. Ltd.
7. Kurian Nainan P. "Design of Foundation System- Principles &Practices", Narosa Publishing House.

(LC) CGE-19012 Geotechnical Laboratory Practice-II

Teaching Scheme:
Practical: 4 Hrs/week

Examination Scheme:
Team Work: 50 Marks
Oral: 50 Marks

Course outcomes:

1. Students will be able to obtain the CBR value of the soils
2. Students will be able to obtain the shear strength parameters of the coarse grained soil using large box direct shear test and drained shear strength parameters of the soil using triaxial test
3. Students will be able to carry out and interpret any three of the field tests such as Seismic refraction test, Electrical resistivity test, Standard penetration test (SPT) / Dynamic cone penetration test as per IS 4968 Part-I(DCPT), Static cone penetration test (SCPT)as per IS 4963 Part III, Plate bearing test, Pressure meter test
4. Student will be able to understand real life geotechnical problems with the help of site visits.

1) The following Laboratory experiments shall be carried out
   - California Bearing Ratio test including swelling pressure
   - Large- Box Shear test
   - Triaxial Consolidated- Drained test
2) Any three of the following field tests may be carried out
   - Seismic refraction test
   - Electrical resistivity test
   - Standard penetration test (SPT) / Dynamic cone penetration test as per IS 4968 Part-I (DCPT)
   - Static cone penetration test (SCPT) as per IS 4963 Part III.
   - Plate bearing test
   - Pressure meter test
3) Report on the basis of the field visit,
4) Use of suitable computer software for analysis and design of substructure, stability of slopes, retaining structure or any other Geotechnical related problem.

Reference

1. SP 36 (Part-II): 1987 Compendium of Indian Standard on Soil Engineering: Part-I & II (Laboratory & Field) testing of soils Civil Engineering purposes.

SBC Dissertation I

Teaching Scheme:

Practical: 14Hrs/week

Mid-sem presentation-40 Mark

End-semPresentation-60 Marks

Examination Scheme:

100marks: Continuous evaluation-

Course outcomes:

1. Students will learn to identify scope for conducting research.
2. Students will learn application of research techniques acquired by them.
3. Students will verify their planning proficiency acquired during the course of program.
4. Students will develop competency to work in professional fields

The Project work will start in semester III, and should preferably be a live problem in the industry or a macro-issue having a bearing on performance of the construction industry and should involve scientific research, design, collection and analysis of data, determining solutions and must preferably bring out the individuals contribution.

Dissertation-I will have mid semester presentation and end semester presentation.
Mid semester presentation should be done along with the report and will include any one of the following.

i) Literature review on any topic associated with the syllabus done by referring to standard journals; papers published in various conferences, and by using the internet, web pages etc; presented in a standard format.

ii) Extracts from various documented case studies associated with a particular area of construction and management; compiled and presented in a standard format.

iii) Information of new lab/field testing/exploration methods, analytical tools viz. FEM, DEM, ANN, Commercial software.

iv) Information of various professional practices adopted in the construction sector for foundation, ground improvement through field interaction.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted. This will be continuation of the same topic as presented during mid-semester presentation.

SBC Dissertation II

Teaching Scheme:

Practical: 18Hrs/week

Mid-sem presentation-30 Marks

Pre-submission-30 Marks

External Exam-40 Marks

Examination Scheme:

100marks: Continuous evaluation-

Course outcomes:

1. Students will learn to initiative actions on their own and work independently.
2. Students will learn application of knowledge acquired by them.
3. Students will verify their planning proficiency acquired during the course of program.
4. Students will develop competency to work in professional fields.

Dissertation –II will be related to work on the topic identified in Dissertation – I. Dissertation-II will have mid semester presentation and pre-submission presentation at the end of the semester.

CONTINUOUS ASSESSMENT OF DISSERTATION – I AND DISSERTATION – II WILL BE MONITORED BY THE DEPARTMENTAL COMMITTEE.