# Shri Shankaracharya Technical Campus,

Shri Shankaracharya Group of Institutions

(An Autonomous Institute affiliated to Chhattisgarh Swami Vivekanand Technical University Bhilai)

Courses of Study and Scheme of Examination of M. Tech

## SCHEME OF EXAMINATION AND SYLLABUS

**M-Tech. 2nd Semester Civil Engineering (Specialization in Geotechnical Engineering)**

| S. No. | Board of Study | Subject Code | Subject | Periods per Week | | | Scheme of Examination Theory / Practical | | | Total Marks | Credit L+(T+P)/2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | ESE | CT | TA | | |
| 1 | Civil Engg. | CE223201 | Geosynthetics and Reinforced Earth | 3 | 1 | 0 | 100 | 20 | 20 | 140 | 4 |
| 2 | Civil Engg. | CE223202 | Soil Structure Interaction | 3 | 1 | 0 | 100 | 20 | 20 | 140 | 4 |
| 3 | Civil Engg. | CE223203 | Soil Improvement Techniques | 3 | 1 | 0 | 100 | 20 | 20 | 140 | 4 |
| 4 | Civil Engg. | CE223204 | Soil Dynamic & Machine Foundation | 3 | 1 | 0 | 100 | 20 | 20 | 140 | 4 |
| 5 | Refer Table- I | | Elective-I | 3 | 1 | 0 | 100 | 20 | 20 | 140 | 4 |
| 6 | Civil Engg. | CE223291 | Advanced Geotechnical Lab | | | 3 | 75 | | 75 | 150 | 2 |
| 7 | Civil Engg. | CE223292 | Geotech Field Testing- II Lab | | | 3 | 75 | | 75 | 150 | 2 |
| **Total** | | | | **15** | **05** | **6** | **650** | **100** | **250** | **1000** | **24** |

**L-Lecture** **T-Tutorial**
**P-Practical,** **ESE- End Semester Exam**
**CT-ClassTest** **TA- Teacher'sAssessment**

***Table-I***

| ELECTIVE- I | | | |
|---|---|---|---|
| **S.No.** | **Board of Study** | **Subject Code** | **Subject** |
| 1 | Civil Engg. | CE223221 | Measurement Techniques in Geotechnical Engineering |
| 2 | Civil Engg. | CE223222 | Tunnel Engineering |
| 3 | Civil Engg. | CE223223 | Environmental Geotechnology |
| 4 | Civil Engg. | CE223224 | Foundation in Difficult Sub Soil |

**Note(1)– 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session.**

| | | October 2020 | 1.00 | Applicable for AY 2020-21 Onwards |
|---|---|---|---|---|
| **Chairman (AC)** | **Chairman (BoS)** | **Date of Release** | **Version** | |

## SCHEME OF EXAMINATION AND SYLLABUS

**M-Tech. 2nd Semester Civil Engineering (Specialization in Geotechnical Engineering)**

**Note(2)– Choice of elective course once made for an examination cannot be changed in futureexaminations.**

| Subject Code | Geosynthetics and Reinforced Earth | L = 3 | T = 1 | P = 0 | Credits = 4 |
|---|---|---|---|---|---|
| CE223201 | ESE | CT | TA | Total | ESE Duration |
| | 100 | 20 | 20 | 140 | 3 Hours |

| Course Objective | Course Outcomes |
|---|---|
| This course will enable students to<br>1. Identify the soil suitable for reinforced earth.<br>2. Identify the type of reinforcing material suitable for the project.<br>3. Design the reinforced earth. | After studying this course, students will be able to:<br>1 Design and incorporate the reinforced earth for the sites at weak soil sites.<br>2: Design the pavements, embankments using reinforced earth to enhance the engineering properties of the soils |

**UNIT- I** **CO1**

Reinforced Earth : Histroy, field of applications, natural fibers, overview of Geotexiles, Geomembranes, Geogrids, Geonets, Geowebs Geomats and Geo-composites, economic aspects of their applications. **[ 8Hrs]**

**UNIT – II** **CO1**

Production ofGeotextiles, comoposites, physical-mechanical, hydraulicand chemical properties. Functions of Geosynthetics, fluid transmission, filtration, separation, protection. **[ 8Hrs]**

**UNIT – III** **CO2**

Soil reinforcement : Basic principle of soil reinforcement, shear strength of reinforced soil, theoretical strength models, factors affecting requirements on synthetic reinforcement, installation techniques **[8Hrs]**

**UNIT – IV** **CO2**

circulation methods : Basic concepts, embankment on soft soils, internal stability, overall stability, foundation stability and bearing capacity. Failures. Construction of the steep slope, retaining walls-external stability, internal stability. **[8Hrs]**

**UNIT – V** **CO2**

Use of Geo-synthetics in Roads and railways, drainage systems- control of groundwater level, dewatering and reclamation of land, use of Geo-membranes for lining applications, management and maintenance. **[8Hrs]**

## SCHEME OF EXAMINATION AND SYLLABUS

**M-Tech. 2nd Semester Civil Engineering (Specialization in Geotechnical Engineering)**

| Subject Code | Geosynthetics and Reinforced Earth | L = 3 | T = 1 | P = 0 | Credits = 4 |
|---|---|---|---|---|---|
| CE223201 | ESE | CT | TA | Total | ESE Duration |
| | 100 | 20 | 20 | 140 | 3 Hours |

**Text Books:**

| S.No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Geo-textiles and GeGmembranes in Civil Engg | Gerard P.T.M. Van Santvro A,A. Balkema | Third | Oxford and tBH publishing company, New Delhi |
| 2 | Reinforced Soil and Geo-textiles. | J.N. Mandal | second | Oxford and tBH publishing company provate Ltd, New Delhi |

**ReferenceBooks:**

| S.No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Soil Reinforcement with Geotextiles | Jewel R A (1996) | Tenth | CIRIA |
| 2 | Reinforcements and Soil Structures | Jones, CJEP (1996) | fourth | Butterworth Publications |
| | | | | |

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## SCHEME OF EXAMINATION AND SYLLABUS

**M-Tech. 2nd Semester Civil Engineering (Specialization in Geotechnical Engineering)**

| Subject Code CE223202 | SOIL STRUCTURE INTERACTION | L = 3 | T = 1 | P = 0 | Credits =4 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | Total | ESE Duration |
| | 100 | 20 | 20 | 140 | 3 Hours |

| Course Objective | Course Outcomes |
|---|---|
| This course will enable students to 1. The knowledge about another types of foundation like well and pile foundation and their design criterion.<br>2. Know about problems associated with expansive soils and contaminated soils and their remedial measures.<br>3. Make students understand soil structure. | After studying this course, students will be able to:<br>1 To know different types of foundations, their general requirements and loads imposed.<br>2: To learn the analysis of conventional footings.<br>3: To analyze the behavior of pile foundations, transmission towers and water front structures.<br>4: To learn various techniques of soil-structure interaction analysis. |

**UNIT I:** **CO1**

Review of conventional methods of foundation design, Nature and complexity of soil structure interaction, selection and use of field and lab data for foundation design. Selection and suitability of foundation type. **[ 8Hrs]**

**UNIT- ll:** **CO2**

Design of isolated and combined footing foundation. Proportioning of footing for equal settlements. Study of code of practice for design of isolated and combined footing. Numerical related to field data for design practice. **[ 8Hrs]**

**UNIT- lll :** **CO3**

Design of raft foundation, General considerations and various methods of design of raft foundations. Floating foundations . Analysis and design of floating foundations. Suitability of floating foundations . **[ 8Hrs]**

**UNIT- IV :** **CO4**

Deep foundation and its selection criteria based on soil properties. Design of pile foundation. Group pile design and its suitability. Instrumental set up and data analysis of pile load test. **[ 8Hrs]**

**UNIT- V :** **CO4**

Foundation in expansive soil. Typical terrain and selection criteria based on various soil parameters. Study of settlement behavior of foundation in black-cotton soil. Case studies to learn through real examples. **[ 5Hrs]**

| S.No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Soil-Structure Interaction | A. S. Cakmak | Third | Elsevier Scientific, Amsterdam |
| 2 | Soil-Structure Interaction. | J.W. Bull | second | CRC Press |
| 3 | | | | |

**ReferenceBooks:**

| S. No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | .Analytical and Computer Methods in Foundation | Bowels J.E | Tenth | McGraw Hill Book Co., New York, 1974 |
| 2 | Soil Mechanics and Foundation Engineering | S K Garg | fourth | Khanna Publishers |
| 3 | | | | |

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## SCHEME OF EXAMINATION AND SYLLABUS

**M-Tech. 2nd Semester Civil Engineering (Specialization in Geotechnical Engineering)**

| Subject Code CE223203 | Soil Improvement Techniques | L = 3 | T = 1 | P = 0 | Credits = 4 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | Total | ESE Duration |
| | 100 | 20 | 20 | 140 | 3 Hours |

| Course Objective | Course Outcomes |
|---|---|
| To impart knowledge about the various ground improvement techniques.<br><br>To enable the students to understand the factors that controls the choice of ground improvement tec hnique as per the field condition. | On successful completion of the course, the student will be able to:<br>**CO1:-** Student will be able to understand the basic mechanics of the various ground improvement techniques.<br>**CO2:-** Apply the appropriate ground improvement technique to the field situation.<br>**CO3:-** Know about the problems associated with weak soil deposits.<br>**CO4:-** To know about the in situ compaction and soil improvement techniques.<br><br>**CO5:-** To know about the stone column, vibrofloatation and their applications. |

**UNIT I** **CO1**

Types of Soil Structure – Clay Minerals – Characteristics and Construction of mineral groups – soil water. **[5Hrs]**

**UNIT–II** **CO2**

Definitions – Principles – Objectives – Field compaction methods – suitability of field compaction methods – field compaction controls – methods **[4Hrs]**

**UNIT – III** **CO3**

Weak Deposits- Identification-Problems associated with weak deposits- Mitchel chart of Applicability of treatment methods. . **[5Hrs]**

**UNIT – IV** **CO4**

Insitu compaction of cohesion less soil – Injection and grouting – stabilization of soils – Preloading and sand drains , Prefabricated vertical drain, Earth reinforcement , Geosynthesics , Mechanical stabilized earth wall **[5Hrs]**

**UNIT –V** **CO5**

Vibroflotation - Stone column – Encased stone column , Stone column design – strengthening of subsoil by stone column installation, Ground Water Control – Methods – Diaphragm techniques – well point system **[5Hrs]**

**Text Books:**

| S.No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Construction and Geotechnical Methods in Foundation Engineering | Koerner R M | Publishing Co. Ltd., 1984 | McGraw Hill |
| 2 | Engineering Principles of Ground Modification | Hausmann M.R. | Company, New York - 1990 | McGraw Hill Publishing |

**ReferenceBooks:**

| S. No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Soil Improvement Technique and their Evolution | W.E. Van Impe | 1st edition | CRC Press |
| 2 | Foundation Engineering for Difficult Subsoil Conditions | Zeevart L | 2nd Edition | Van NostrandReinheld Co., Newyork, 1973. |

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## SCHEME OF EXAMINATION AND SYLLABUS

**M-Tech. 2nd Semester Civil Engineering (Specialization in Geotechnical Engineering)**

| Subject Code CE223204 | GEODYNAMICS AND MACHINE FOUNDATIONS | L = 3 | T = 1 | P = 0 | Credits =4 |
|---|---|---|---|---|---|
| Evaluation scheme | ESE | CT | TA | Total | ESE Duration |
| | 100 | 20 | 20 | 140 | 3 Hours |

| Course Objective | Course Outcomes |
|---|---|
| This course will enable students to 1. To study vibration concepts in soils like damping, wave propagation, resonance and effect of modes of vibrations<br>• To study dynamic soil properties.<br>Determination of dynamic properties by field and laboratory tests<br>• Effect of liquefaction and anti liquefaction measures<br>• To study vibration isolation, machine foundation design. | During this course, students will be trained :<br>1 To develop a mechanism to design the foundations for resisting vibrations and achieve static equilibrium conditions of structures<br>2 To understand the classical geotechnical failures due to liquefaction and mitigate the same.<br>3 Design of foundations in large structures like power plants, other industrial buildings etc., for analysing the vibrating waves which can be isolated and measures for achieving safety of the adjacent foundations |

**UNIT I:** **CO1**

THEORY OF VIBRATIONS : Definitions; degree of freedom, damping, amplitude, period, natural frequency. Harmonic motion, free & forced vibrations of a single degree of freedom system, un damped and damped system. Logarithmic decrement, transmissibility. Vibrations of multiple degree of freedom systems. **[ 8Hrs]**

**UNIT- ll:** **CO1**

WAVE PROPAGATION & DYNAMIC SOIL PROPERTIES : Wave propagation in elastic infinite medium, wave propagation in elastic half space. Soil spring constants. Dynamic moduli, poission's ratio, field & laboratory techniques, cyclic shear test, cyclic plate load test, block vibration test, seismic refraction tests, high strain tests. **[ 8Hrs]**

**UNIT- lll :** **CO2**

MACHINE FOUNDATIONS: General Principles: Type of machine and foundations, modes of vibration of a rigid foundation block, general requirements, Permissible amplitude and allowable soil pressure General design criteria, ls codes **[ 8Hrs]**

**UNIT- IV :** **CO3**

DESIGN OF MACHINE FOUNDATIONS : Foundations for impact type machine, design procedure for hammer foundations. Foundations for reciprocating & rotary type machines **[ 8Hrs]**

**UNIT- V :** **CO3**

VIBRATION ISOLATION AND SCREENING. Force and motion isolation, screening of vibrations, materials for base isolation. **[ 8Hrs]**

| S.No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Soil Dynamics and Machine Foundations | Swamisaran (2010) | Third | Galgotia publications Pvt. Ltd. New Delhi |
| 2 | Dynamics of Bases and Foundations | Barken DD | second | Mc Graw Hill NewYork |
| 3 | Soil Dynamics | Prakash (1981) | seventh | S. McGraw Hill Book Company |

**ReferenceBooks:**

| S. No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Vibration Analysis and Foundation Dynamics(1998)-., | Kameswara Rao, N. S. V | Tenth | Wheeler Publication Ltd |
| 2 | Foundation for Machines (1998).: Analysis and Design, | Prakash, S. and Puri, V. K | fourth | John Wiley & Sons |
| 3 | | | | |

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## SCHEME OF EXAMINATION AND SYLLABUS

**M-Tech. 2nd Semester Civil Engineering (Specialization in Geotechnical Engineering)**

| Subject Code CE223221 | Measurement Techniques in Geotechnical Engineering | L = 3 | T = 1 | P = 0 | Credits = 4 |
|---|---|---|---|---|---|
| Evaluation scheme | ESE | CT | TA | Total | ESE Duration |
| | 100 | 20 | 20 | 140 | 3 Hours |

| Course Objective | Course Outcomes |
|---|---|
| This course is designed to provide an introduction to dynamics with Soil Dynamics and Geotechnical Earthquake Engineering. The fundamental theoretical and computational aspects of dynamics are developed for important | On successful completion of the programme the students will:<br>1. To knowthe theories of earth pressuremeasurements of ground movements .<br>2. To understand and analyses how and where different structures such as earth dams and to measure.<br>3. To understand and apply the theories of wave propagation in elastic media, evaluate dynamic properties of soil by various lab and field testing methods.<br>4. To perform ground response analysis and understand the local site effects.<br>5. To understand various earthquake induced hazards and different remedial measures (ground improvement methods). |

**Unit:I** **CO1**

Introduction -load measurements -pore water pressure measurements - earth pressure measurements - measurements of ground movements **[ 8Hrs]**

**Unit:II** **CO2**

Instrumentation of different structures such as earth dams -foundations, retaining walls, rock slopes, their recording and processing. **[ 8Hrs]**

**Unit:III** **CO3**

Consolidation test and its applications to settlement computations. **[ 8Hrs]**

**Unit:IV** **CO4**

Shear test: triaxial shear test -pore pressure & volume change during shear -vane shear test - measurements of A & B parameters. **[ 5Hrs]**

**Unit:V** **CO5**

Techniques of field measurements of penetration resistance (Static /Dynamic) plate load test - resistivity of soil -compression and tensile tests on rock cores **[ 8Hrs]**

**Text Books:**

| S.No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | "Foundation Instrumentation", | Hanna T H | Ninth | Trans Tech Publication, Ohio, 1985 |
| 2 | Geotechnical Instrumentation for Monitoring Field Performance | Dunnicliff J &Gree G E, | Seventh | JohnWiley, 1988 |

**ReferenceBooks:**

| S. No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Soil Dynamics | SamsherPrakash | Seventh | CBS Publishers and Distributors |
| 2 | Soil Dynamics and machine foundation | Swamisaran, | Sixth | GalgotiaPub.Pvt Ltd New Delhi |
| 3 | Soil Dynamics and Earthquake Engineering | Bharat Bhusan Prasad | Sixth | PHI Learning Pvt. Ltd New Delhi |

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## SCHEME OF EXAMINATION AND SYLLABUS

**M-Tech. 2nd Semester Civil Engineering (Specialization in Geotechnical Engineering)**

| Subject Code CE223222 | TUNNEL ENGINEERING | L = 3 | T = 1 | P = 0 | Credits =4 |
|---|---|---|---|---|---|
| Evaluation scheme | ESE | CT | TA | Total | ESE Duration |
| | 100 | 20 | 20 | 140 | 3 Hours |

| Course Objective | Course Outcomes |
|---|---|
| Tunnel engineering deals with the fields of tunnel engineering ,geotechnical parameter, ground improvement, computer based design of tunnel and economy in design of tunnels.. | On successful completion of the course, the student will be able to:<br>CO1:- To teach students about effects of Tunnel engineering<br>CO2:- To learn Tunnel alignment<br>CO3:- : To Study of various geotechnical parameters for deciding feasibility of tunnels<br>CO4:- explain the concepts Tunnel construction-construction in hard rock and soft ground<br>CO5:- to study Computer based design of tunnels |

**UNIT I:** **CO1**

Definitions, different types of tunnels for different purposes, brief history of tunnels of world Shapes and sizes of tunnels for their purposes. **[ 5Hrs]**

**UNIT- ll:** **CO2**

Tunnel alignment- Transfer of center line on ground, various modern methods. **[ 5Hrs]**

**UNIT- lll :** **CO3**

Study of various geotechnical parameters for deciding feasibility of tunnels, Various ground improvement measures for tunnel construction like grouting, strengthening of rock, rock bolting. **[5Hrs]**

**UNIT- IV :** **CO4**

Tunnel construction-construction in hard rock and soft ground. Drilling, blasting, quarrying, subsidence and caving Percolation and dewatering during construction. Handling of unexpected. source of water, muck hauling, lighting and ventilation in tunnel **[ 5Hrs]**

**UNIT- V :** **CO5**

Computer based design of tunnels, Economy in design of tunnels, tunnet ning routine and regular maintenance of tunnels for smooth running. **[ 5Hrs]**

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| S.No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Tunnel Engineering | Subhash C. Saxena | fourth | Dhanpati Rai Publication |
| 2 | Harbour Dock and Tunnel Engineering | R Srinivasan. | seventh | Charotar Publishing House |

**ReferenceBooks:**

| S. No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Railway Bridge And Tunnel Engineering | Rangawala | Tenth | Charotar Publishing House Pvt. Ltd. |
| 2 | Handbook of Tunnel Engineering: Volume I: Structures and Methods | Bernhard Maidl, Markus Thewes, Ulrich Maidl | First Edition | Butterworth Publications |
| 3 | | | | |

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## SCHEME OF EXAMINATION AND SYLLABUS

**M-Tech. 2nd Semester Civil Engineering (Specialization in Geotechnical Engineering)**

| Subject Code CE223223 | Environmental Geotechnology | L = 3 | T = 1 | P = 0 | Credits = 4 |
|---|---|---|---|---|---|
| **Evaluation Scheme** | **ESE** | **CT** | **TA** | **Total** | **ESE Duration** |
| | **100** | **20** | **20** | **140** | **3 Hours** |

| Course Objective | Course Outcomes |
|---|---|
| Environmental Geotechnology deals withthe fields of environmental management, site characterization, pile driving and control mechanisms, solid waste disposal, in order to meet the needs of a society. | On successful completion of the course, the student will be able to:<br>**CO1:-**To teach students about effects of environment on foundation<br>**CO2:-**To learn settlement of uncompact soil<br>**CO3:-**To study hazardous waste management<br>**CO4:-**explain the concepts pile driving<br>**CO5:-** to study mechanisms of landslide |

**UNIT-I** **CO1**

Sources and Site Characterization: Scope of Geoenvironmental Engineering, Various Sources of Contaminations, Need for contaminated site characterization; and Characterisation methods. **[ 5Hrs]**

**UNIT-II** **CO2**

Solid and Hazardous Waste Management: Classification of waste, Characterisation of solid wastes, Environmental Concerns with waste, waste management strategies. **[ 5Hrs]**

**UNIT-III** **CO3**

Contaminant Transport: Transport process, Mass-transfer process, Modeling, Bioremediation, Phytoremediation. **[ 5Hrs]**

**UNIT-IV** **CO4**

Remediation Techniques: Objectives of site remediation, various active and passive methods, remediation of NAPL sites, Emerging Remediation Technologies. **[ 5Hrs]**

**UNIT-V** **CO5**

Landfills: Types of landfills, Site Selection, Waste Containment Liners, Leachate collection system, Cover system, Gas collection system. **[ 5Hrs]**

**Text Books:**

| S.No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Geotechnology of Waste Management | Oweis I Sand Khera R P | 1st | Butterworth & Co. |
| 2 | Environmental Indices: Theory and Practice | Oft W R | 1st | United States: N. p., 1978. Web. |

**ReferenceBooks:**

| S. No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1. | Geotechnical Engineering | Donald P. Coduto , Man-chu Ronald Yeung , Willia m A. Kitch | 2nd | Pearson Education India |
| 2. | Principles of Geotechnical Engineering | Braja M. Das, Thomson. | - | Cengage Learning Custom Publishing |

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## SCHEME OF EXAMINATION AND SYLLABUS

**M-Tech. 2nd Semester Civil Engineering (Specialization in Geotechnical Engineering)**

| Subject Code CE223224 | FOUNDATION IN DIFFICULT SUB SOIL | L = 3 | T = 1 | P = 0 | Credits =4 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | Total | ESE Duration |
| | 100 | 20 | 20 | 140 | 3 Hours |

| Course Objective | Course Outcomes |
|---|---|
| The objective is to make the students to understand and conceptualize to plan and execute sub-soil exploration programmes for different field projects. | On successful completion of the course, the student will be able to:<br>**CO1:-**to understand about the weak deposits of soil.<br>**CO2:-**to study about ground improvement methods.<br>**CO3:-**to learn about Insitu densification of soils.<br>**CO4:-**to study about Stone columns methods.<br>**CO5:-**to study about Geotechnical aspects of waste management. |

**UNIT- I** **CO1**

Weak Deposits- Identification-Problems associated with weak deposits- Mitchel chart of applicability of treatment methods. . **[5Hrs]**

**UNIT – II** **CO2**

Introduction role of ground improvement in foundation engineering - drainage techniques -well point vacuum and electronic methods. **[ 8Hrs]**

**UNIT – III** **CO3**

Insitu densification of soils -dynamic compaction -blasting dynamic consolidation -preloading with sand drains. **[8Hrs]**

**UNIT – IV** **CO4**

Stone columns methods of installation vibro-flotation technique -grouting and stabilization -earth reinforcement geosynthesics. **[8Hrs]**

**UNIT –V** **CO5**

Geotechnical aspects of hazardous waste management - hazardous waste management - environmental geotechnical consideration, Foundation on expansive soil -collapsible soil. **[5Hrs]**

**Text Books:**

| S.No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Foundation Engineering | – R. B. Peck, W. E. Hanson, and T. H. Thornburn (John Wiley) | first | John Wiley |
| 2 | Soil Mechanics and Foundation Engineering | S.N. Murthy | second | DhanpatRai Publications |

**ReferenceBooks:**

| S. No. | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Foundation Engineering in Difficult Ground | Bell F G | first | Butter Worth |
| 2 | Engineering Principles of Ground Modification | Hausmann M.R | first | McGraw Hill Publishing Company, New York |
| | Geo-synthetics World | Mandal J. N. | second | Wiley Eastern Limited |

## SCHEME OF EXAMINATION AND SYLLABUS

**M-Tech. 2nd Semester Civil Engineering (Specialization in Geotechnical Engineering)**

| Subject Code CE223291 | Advance Geotech- Lab | L = 0 | T = 0 | P = 10 | Credits = 5 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | Total | ESE Duration |
| | 075 | - | 75 | 150 | 3 Hours |

**Experiments to be performed (Minimum 10 experiments to be performed)**

1. Cyclic tri-axial shear test
2. Pneumatic box - shear test
3 Centrifugal modeling of Geotechnical problems.
4. Determination of swelling pressure of cohesive soils
5. Brazilian tensile strength of rock samples_
6. Determination of point load index of rock samples.
7. To determine safe bearing capacity of rocks.
8. Determination of rock porosity
9. Determination of RQD.
10. Visual Classification Tests.
11. Exploratory borings by different methods including auger boring, wash boring, percussion drilling and rotary drilling.
12. Resonant column test.

**Text Books:**


1. Shamsher Prakash, (1979) “Engineering Soil Testing ”, Nemichand, New Delhi.
2. Joesph E Bowles, “Engineering Properties of soil and their measurements”, McGraw hill


**Reference Books:**


1. John T. Germaine, Amy V. Germaine, (2009) “Geotechnical Laboratory Measurements”, John Wiely
2. William Lambe, (2003) “Soil Tsting for Engineers”, MIT.

## SCHEME OF EXAMINATION AND SYLLABUS

**M-Tech. 2nd Semester Civil Engineering (Specialization in Geotechnical Engineering)**

| Subject Code CE223292 | Geo-Tech Field Testing-II Lab | L = 0 | T = 0 | P = 10 | Credits = 5 |
|---|---|---|---|---|---|
| Evaluation Scheme | ESE | CT | TA | Total | ESE Duration |
| | 075 | - | 75 | 150 | 3 Hours |

**Experiments to be performed (Minimum 10 experiments to be performed)**

1. Determination of coefficient of elastic uniform compression using cyclic plate load test.
2. Geophysical Examination - Electrical resistivity test.
3. Geo physical examination - seismic refraction test.
4. Rock sampling techniques.
5. Determination of RMR.
6. Determination of pile load carrying capacity in clayey and sandy strata.
7. Study of ground penetration radar.
8. Bankelman beam test.
9. Study of the Block Vibration Test.
10. Study of the Field Vane Shear Test.
11. Determination of Chemical Properties of soil such as chloride, phosphorous, Potassium, Magnesium, calcium, Sodium etc.
12. Determination of pH and organic solids.

**Text Books:**


1. Shamsher Prakash, (1979) “Engineering Soil Testing ”, Nemichand, New Delhi.
2. Joesph E Bowles, “Engineering Properties of soil and their measurements”, McGraw hill


**Reference Books:**


1. John T. Germaine, Amy V. Germaine, (2009) “Geotechnical Laboratory Measurements”, John Wiely
2. William Lambe, (2003) “Soil Tsting for Engineers”, MIT.