

**III Year – I SEMESTER**

<b>T</b>	<b>P</b>	<b>C</b>
<b>3+1*</b>	<b>0</b>	<b>3</b>

**CE 501 - ENGINEERING GEOLOGY**

Lecture :	3 hrs/Week	Internal Assessment :	30 Marks
Tutorial :	1 hrs/Week	Semester End Examination :	70 Marks
Practical :	--	Credits :	3

**Course Learning Objectives:**

The objective of this course is:

1. To introduce the Engineering Geology as a subject in Civil Engineering.
2. To enable the student to use subject in civil engineering applications.

**Course Outcomes:**

Upon the successful completion of this course, the students will be able to:

- a. Identify and classify the geological minerals.
- b. Measure the rock strengths of various rocks.
- c. Classify and measure the earthquake prone areas to practice the hazard zonation.
- d. Classify, monitor and measure the Landslides and subsidence.
- e. Prepares, analyses and interpret the Engineering Geologic maps
- f. Analyses the ground conditions through geophysical surveys.
- g. Test the geological material and ground to check the suitability of civil engineering project construction.
- h. Investigate the project site for mega/mini civil engineering projects.Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc...

**SYLLABUS:****UNIT-I:**

**Introduction:** Branches of Geology, Importance of Geology in Civil Engineering with case studies.

**Weathering:** Weathering of rocks, Geological agents, weathering process of Rock, River process and their development.

## UNIT-II

**Mineralogy And Petrology:** Definitions of mineral and rock, Different methods of study of mineral and rock, The study of physical properties of minerals and rocks for megascopic study for the following minerals and rocks, Common rock forming minerals are Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and other ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite And Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

## UNIT-III

**Structural Geology:** Strike, Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

## UNIT-IV

**Ground Water:** Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques.

**Earthquakes And Land Slides:** Terminology, Classification, causes and effects, Shield areas and Seismic belts, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Land slides.

## UNIT-V

**Geophysics:** Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

## UNIT-VI

**Geology Of Dams, Reservoirs And Tunnels:** Types and purpose of Dams, Geological considerations in the selection of a Dam site. Life of Reservoirs Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

**TEXT BOOKS:**

1. 'Engineering Geology' by Subinoy Gangopadhyay, Oxford University press.
2. 'Engineering Geology' by D. Venkat Reddy, Vikas Publishing House pvt. Ltd, 2013.
3. 'Engineering Geology' by N. Chenn Kesavulu, Trinity Press (Laxmi Publications), 2<sup>nd</sup> Edition, 2014.
4. 'Engineering Geology' by Vasudev Kanithi, University Press.

**REFERENCES:**

1. 'Engineering Geology for Civil Engineers' by P.C. Varghese, PHI learning pvt. Ltd.
2. 'Geology for Engineers and Environmental Society' by Alan E Kehew, person publications, 3<sup>rd</sup> edition
3. 'Fundamentals of Engineering Geology' by P.G. Bell, B.S.P. Publications, 2012.
4. 'Engineering Geology' by V.Parthesarathi et al., Wiley Publications
5. 'Environmental Geology' by K.S. Valdiya, McGraw Hill Publications, 2<sup>nd</sup> ed.

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**CE502 - STRUCTURAL ANALYSIS – II**

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

**Course Learning Objectives:**

The objective of this course is:

1. Familiarize Students with Different types of Structures
2. Equip student with concepts of Arches
3. Understand Concepts of lateral Load analysis
4. Familiarize Cables and Suspension Bridges
5. Understand Analysis methods Moment Distribution, Kanis Method and Matrix methods.

**Course Outcomes:**

At the end of this course; the student will be able to

- a. Differentiate Determinate and Indeterminate Structures
- b. Carryout lateral Load analysis of structures
- c. Analyze Cable and Suspension Bridge structures
- d. Analyze structures using Moment Distribution, Kani's Method and Matrix methods.

**SYLLABUS:****UNIT I**

**Three Hinged Arches:** Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature.

**Two Hinged Arches:** Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, tied arches – fixed arches – ( No analytical question).

**UNIT-II**

**Lateral Load Analysis Using Approximate Methods:** application to building frames. (i) Portal method (ii) Cantilever method.

### UNIT – III

**Cable Structures And Suspension Bridges:** Introduction, characteristics of cable, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge, three hinged and two hinged stiffening girder suspension bridges.

### UNIT – IV

**Moment Distribution Method:** Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – Portal frames – including Sway-Substitute frame analysis by two cycle.

### UNIT – V

**Kani's Method:** Analysis of continuous beams – including settlement of supports and single bay portal frames with and without side sway.

### UNI – VI

#### **Introduction to Matrix Methods:**

Flexibility methods: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

Stiffness method: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

#### **TEXT BOOKS:**

1. 'Structural Analysis' by T.S.Thandavamoorthy, Oxford university press, India.
2. 'Structural Analysis' by R.C. Hibbeler, Pearson Education, India
3. 'Theory of Structures – II' by B.C.Punmia, Jain & Jain, Laxmi Publications, India.
4. 'Structural Analysis' by C.S. Reddy, Tata Mc-Graw hill, New Delhi.

#### **REFERENCES:**

1. 'Intermediate Structural Analysis' by C. K. Wang, Tata McGraw Hill, India.
2. 'Theory of structures' by Ramamuratam, Dhanpatrai Publications.
3. 'Analysis of structures' by Vazrani & Ratwani – Khanna Publications.
4. 'Comprehensive Structural Analysis-Vol.I&2' by Dr. R. Vaidyanathan & Dr. P. Perumal- Laxmi Publications Pvt. Ltd., New Delhi.

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**CE503-DESIGN AND DRAWING OF REINFORCED  
CONCRETE STRUCTURES**

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

**Course Learning Objectives:**

The objective of this course is:

1. Familiarize Students with different types of design philosophies
2. Equip student with concepts of design of flexural members
3. Understand Concepts of shear, bond and torsion
4. Familiarize students with different types of compressions members and Design
5. Understand different types of footings and their design

**Course Outcomes:**

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

- a. Work on different types of design philosophies
- b. Carryout analysis and design of flexural members and detailing
- c. Design structures subjected to shear, bond and torsion
- d. Design different type of compression members and footings

**SYLLABUS:****UNIT –I**

**Introduction:** Working stress method Design codes and handbooks, loading standards – Dead, live, wind and earthquake loads, elastic theory, design constants, modular ratio, neutral axis depth and moment of resistance, balanced, under-reinforced and over-reinforced sections, working stress method of design of singly and doubly reinforced beams.

**Limit State Design:** Concepts of limit state design – Basic statistical principles – Characteristic loads –Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters – limiting moment of Resistance.

## UNIT –II

**Design for Flexure:** Limit state analysis and design of singly reinforced sections- effective depth- Moment of Resistance- Doubly reinforced and flanged (T and L) beam sections- Minimum depth for a given capacity- Limiting Percentage of Steel- Minimum Tension Reinforcement- Maximum Flexural Steel- Design of Flanged Sections (T&L)- Effective width of flange –Behavior- Analysis and Design.

## UNIT – III

**Design for Shear, Torsion and Bond:** Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.**Limit state design for serviceability:** Deflection, cracking and code provision, Design of formwork for beams and slabs.

## UNIT – IV

**Design of Compression members:** Effective length of a column, Design of short and long columns – under axial loads, uniaxial bending and biaxial bending – Braced and un-braced columns – I S Code provisions.

## UNIT –V

**Footings:** Different types of footings – Design of isolated and combined footings - rectangular and circular footings subjected to axial loads, uni-axial and bi-axial bending moments.

## UNIT – VI

**Slabs:** Classification of slabs, design of one - way slabs, two - way slabs, and continuous slabs using IS Coefficients (conventional), design of waist-slab staircase.

**NOTE:** All the designs to be taught in Limit State Method

Following plates should be prepared by the students.

1. Reinforcement detailing of T-beams, L-beams and continuous beams.
2. Reinforcement detailing of columns and isolated footings.
4. Detailing of one-way, two-way and continuous slabs and waist-slab staircase.

## INTERNAL EXAMINATION PATTERN:

The total internal marks (30) are distributed in three components as follows:

1. Descriptive (subjective type) examination : 25 marks
2. Assignment : 05 marks

**FINAL EXAMINATION PATTERN:**

The end examination paper should consist of Part A and Part B. Part A consists of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

**TEXT BOOKS:**

1. 'Limit State Design' by A. K. Jain
2. 'Design of Reinforced concrete Structures' by N. Subrahmanyian
3. 'Reinforced Concrete Structures' by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill, New Delhi.

**REFERENCES:**

1. 'Design of concrete structures' by Arthus H. Nilson, David Darwin, and Chorles W. Dolar, Tata McGrawHill, 3rd Edition, 2005.
2. 'Reinforced Concrete Structures' by Park and Pauley, John Wiley and Sons.

**IS Codes:**

- 1) IS -456-2000 (Permitted to use in examination hall)
- 2) IS – 875
- 3) SP-16

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**CE504-GEOTECHNICAL ENGINEERING – I**

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

**Course Learning Objectives:**

The objective of this course is:

1. To enable the student to determine the index properties of the soil and classify it.
2. To impart the concept of seepage of water through soils and determine the discharge of water through soils.
3. To impart the principles of compaction and consolidation of soils and determine the magnitude and the rate of consolidation settlement.
4. To enable the student to understand the concept of shear strength of soils, determine the shear parameters of sands and clays and the areas of their application.

**Course Outcomes:**

Upon the successful completion of this course

- a. The student must know the definition of the various quantities related to soil mechanics and establish their inter-relationships.
- b. The student should be able to know the methods of determination of the various index properties of the soils and classify the soils.
- c. The student should be able to know the importance of the different engineering properties of the soil such as compaction, permeability, consolidation and shear strength and determine them in the laboratory.
- d. The student should be able to apply the above concepts in day-to-day civil engineering practice.

**SYLLABUS:****UNIT – I**

**Introduction:** Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship –Relative density - Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control.

**UNIT – II**

**Index Properties Of Soils:** Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – Various Types of soil Classifications – Unified soil classification and I.S. Soil classification.

**UNIT –III**

**Permeability:** Soil water – capillary rise – One dimensioned flow of water through soils – Darcy’s law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems. Total, neutral and effective stresses –quick sand condition – 2-D flow and Laplace’s equation - Seepage through soils –Flow nets: Characteristics and Uses.

**UNIT – IV**

**Stress Distribution In Soils:** Stresses induced by applied loads - Boussinesq’s and Westergaard’s theories for point loads and areas of different shapes– Newmark’s influence chart – 2:1 stress distribution method.

**UNIT – V**

**Consolidation:** Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi’s theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation ( $c_v$ ) - Over consolidated and normally consolidated clays.

**UNIT - VI**

**Shear Strength of Soils:** Basic mechanism of shear strength - Mohr – Coulomb Failure theories – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-Strain behavior of clays – Shear Strength determination- various drainage conditions.

**TEXT BOOKS:**

1. ‘Basic and Applied Soil Mechanics’ by Gopal Ranjan and A.S.R.Rao, New Age International Publishers.
2. ‘Soil Mechanics and Foundation Engineering’ by V.N.S.Murthy ,CBS publishers.
3. ‘Soil Mechanics’ by M.Palani Kumar, PHI Learning.

**REFERENCES:**

1. ‘Fundamentals of Soil Mechanics’ by D.W.Taylor., Wiley.
2. ‘An introduction to Geotechnical Engineering’ by Holtz and Kovacs; Prentice Hall.

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**CE505-TRANSPORTATION ENGINEERING – I**

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

**Course Learning Objectives:**

The objective of this course is:

1. To impart different concepts in the field of Highway Engineering.
2. To acquire design principles of Highway Geometrics and Pavements
3. To learn various highway construction and maintenance procedures.

**Course Outcomes:**

Upon the successful completion of this course, the students will be able to:

- a. Plan highway network for a given area.
- b. Determine Highway alignment and design highway geometrics.
- c. Design Intersections and prepare traffic management plans.
- d. Judge suitability of pavement materials and design flexible and rigid pavements.
- e. Construct and maintain highways

**SYLLABUS:****UNIT I**

**Highway Planning and Alignment:** Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans – First, second, third road development plans, road development vision 2021, Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

**UNIT – II**

**Highway Geometric Design:** Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment- Design of

Super elevation and Extra widening- Design of Transition Curves-Design of Vertical alignment-Gradients- Vertical curves.

### UNIT – III

**Traffic Engineering:**Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents-Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals –Webster Method –IRC Method.

### UNIT – IV

**Highway Materials:**Subgrade soil: classification –Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties – Tests on Bitumen – Bituminous paving mixes: Requirements – Marshall Method of Mix Design.

### UNIT – V

**Design Of Pavements:**Types of pavements; Functions and requirements of different components of pavements; Design Factors

**Flexible Pavements:** Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements.

**Rigid Pavements:** Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

### UNIT – VI

**Highway Construction and Maintenance:**Types of Highway Construction – Earthwork; Construction of Earth Roads, Gravel Roads, Water Bound Macadam Roads, Bituminous Pavements and Construction of Cement Concrete Pavements.

Pavement Failures, Maintenance of Highways, pavement evaluation, strengthening of existing pavements.

**TEXT BOOKS:**

1. 'Highway Engineering' by Khanna S.K., Justo C.E.G and Veeraragavan A, Nem Chand Bros, Roorkee.
2. 'Traffic Engineering and Transportation' Planning by Kadiyali L.R, Khanna Publishers, New Delhi.
3. 'Highway Engineering' by Srinivasa Kumar R, Universities Press, Hyderabad.

**REFERENCES:**

1. 'Transportation Engineering and Planning' by Papacostas C.S. and PD Prevedouros, Prentice Hall of India Pvt. Ltd; New Delhi.
2. 'Principles of Highway Engineering' by Kadiyali LR, Khanna Publishers, New Delhi.
3. 'Transportation Engineering - An Introduction' by Jotin Khisty C, Prentice Hall, Englewood Cliffs, New Jersey.
4. 'Highway Engineering' by Paul H. Wright and Karen K Dixon, Wiley Student Edition, Wiley India (P) Ltd., New Delhi .
5. 'Principles of Transportation Engineering' by Partha Chakroborthy and Animesh Das, PHI Learning Private Limited, Delhi
6. 'Practice and Design of Highway Engineering' by Sharma SK, Principles, S.Chand & Company Private Limited, New Delhi.

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**III Year – I SEMESTER**

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3+1*	0	2

**INTELLECTUAL PROPERTY RIGHTS AND PATENTS****Unit I**

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.

**Unit II**

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law- Semiconductor Chip Protection Act.

**Unit III**

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

**Unit IV**

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law

**Unit V**

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.

**Unit VI**

Introduction to Cyber Law – Information Technology Act - Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy - International aspects of Computer and Online Crime.

**REFERENCE BOOKS:**

1. Deborah E.Bouchoux: “Intellectual Property”. Cengage learning , New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western’s Special Topics Collections
4. Prabhuddha Ganguli: ‘ Intellectual Property Rights” Tata Mc-Graw – Hill, New Delhi
5. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
6. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.
7. M.Ashok Kumar and Mohd.Iqbal Ali: “Intellectual Property Right” Serials Pub.

**III Year – I SEMESTER**

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**CE507-GEOTECHNICAL ENGINEERING LAB**

Lecture :	--	Internal Assessment :	25 Marks
Tutorial :	--	Semester End Examination :	50 Marks
Practical :	3 hrs/Week	Credits :	2

**Course Learning Objectives:**

The objective of this course is:

1. To impart knowledge of determination of index properties required for classification of soils.
2. To teach how to determine compaction characteristics and consolidation behavior from relevant lab tests; to determine permeability of soils.
3. To teach how to determine shear parameters of soil through different laboratory tests.

**Course Outcomes:**

Upon successful completion of this course, student will be able to

- a. Determine index properties of soil and classify them.
- b. Determine permeability of soils.
- c. Determine Compaction, Consolidation and shear strength characteristics.

**SYLLABUS:****LIST OF EXPERIMENTS**

1. Specific gravity, G
2. Atterberg's Limits.
3. Field density-Core cutter and Sand replacement methods
4. Grain size analysis by sieving
5. Hydrometer Analysis Test
6. Permeability of soil - Constant and Variable head tests
7. Compaction test
8. Consolidation test (to be demonstrated)
9. Direct Shear test
10. Triaxial Compression test (UU Test)



11. Unconfined Compression test
12. Vane Shear test
13. Differential free swell (DFS)
14. CBR Test

At least **Ten** experiments shall be conducted.

#### **LIST OF EQUIPMENT:**

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrinkage limits
3. Field density apparatus for
  - a) Core cutter method
  - b) Sand replacement method
4. Set of sieves: 4.75 mm, 2 mm, 1 mm, 0.6 mm, 0.42 mm, 0.3 mm, 0.15 mm, and 0.075 mm.
5. Hydrometer
6. Permeability apparatus for
  - a) Constant head test
  - b) Variable head test
7. Universal auto compactor for I.S light and heavy compaction tests.
8. Shaking table, funnel for sand raining technique.
9. Apparatus for CBR test
10. 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity
11. One dimensional consolidation test apparatus with all accessories.
12. Triaxial cell with provision for accommodating 38 mm dia specimens.
13. Box shear test apparatus
14. Laboratory vane shear apparatus.
15. Hot air ovens (range of temperature 50<sup>0</sup> - 150<sup>0</sup>C)

#### **Reference:**

1. 'Determination of Soil Properties' by J. E. Bowles.
2. IS Code 2720 – relevant parts.

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**III Year – I SEMESTER**

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**CE508-ENGINEERING GEOLOGY LAB**

Lecture :	--	Internal Assessment :	Marks
Tutorial :	--	Semester End Examination :	Marks
Practical :	3 hrs/Week	Credits :	2

**Course Learning Objectives:**

The objective of this course is:

1. To identify the mega-scopic types of Ore minerals & Rock forming minerals.
2. To identify the mega-scopic types of Igneous, Sedimentary, Metamorphic rocks.
3. To identify the topography of the site & material selection

**Course Outcomes:**

Upon the successful completion of this course, the students will be able to:

- a. Identify Mega-scopic minerals & their properties.
- b. Identify Mega-scopic rocks & their properties.
- c. Identify the site parameters such as contour, slope & aspect for topography.
- d. Know the occurrence of materials using the strike & dip problems.

**SYLLABUS:****LIST OF EXPERIMENTS**

1. Physical properties of minerals: Mega-scopic identification of
  - a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc...
  - b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc...
2. Megascopeic description and identification of rocks.
  - a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc...
  - b) Sedimentary rocks – Sand stone, Ferruginous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc...

- c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc...
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
  4. Simple Structural Geology problems.
  5. Bore hole data.
  6. Strength of the rock using laboratory tests.
  7. Field work – To identify Minerals, Rocks, Geomorphology & Structural Geology.

**LAB EXAMINATION PATTERN:**

1. Description and identification of FOUR minerals
2. Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
3. ONE Question on Interpretation of a Geological map along with a geological section.
4. TWO Questions on Simple strike and Dip problems.
5. Bore hole problems.
6. Project report on geology.

**REFERENCE:**

1. 'Applied Engineering Geology Practicals' by M T Mauthesha Reddy, New Age International Publishers, 2<sup>nd</sup> Edition.
2. 'Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3<sup>rd</sup> edition, 2009.

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**III Year – II SEMESTER**

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<b>3+1*</b>	<b>0</b>	<b>3</b>

**CE601-DESIGN AND DRAWING OF STEEL STRUCTURES**

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

**Course Learning Objectives:**

The objective of this course is to:

1. Familiarize Students with different types of Connections and relevant IS codes
2. Equip student with concepts of design of flexural members
3. Understand Design Concepts of tension and compression members in trusses
4. Familiarize students with different types of Columns and column bases and their Design
5. Familiarize students with Plate girder and Gantry Girder and their Design

**Course Outcomes:**

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

- a. Work with relevant IS codes.
- b. Carryout analysis and design of flexural members and detailing.
- c. Design compression members of different types with connection detailing.
- d. Design Plate Girder and Gantry Girder with connection detailing
- e. Produce the drawings pertaining to different components of steel structures.

**SYLLABUS:****UNIT – I**

**Connections:** Riveted connections – definition, rivet strength and capacity, Welded connections: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

## UNIT – II

**Beams:** Allowable stresses, design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally unsupported beams.

## UNIT –III

**Tension Members and compression members:** General Design of members subjected to direct tension and bending –effective length of columns. Slenderness ratio – permissible stresses. Design of compression members, struts etc.**Roof Trusses:** Different types of trusses – Design loads – Load combinations as per IS Code recommendations, structural details –Design of simple roof trusses involving the design of purlins, members and joints – tubular trusses.

## UNIT – IV

**Design of Columns:** Built up compression members – Design of lacings and battens. Design Principles of Eccentrically loaded columns, Splicing of columns.

## UNIT – V

**Design of Column Foundations:** Design of slab base and gusseted base. Column bases subjected moment.

## UNIT – VI

**Design of Plate Girder:** Design consideration – I S Code recommendations Design of plate girder-Welded – Curtailment of flange plates, stiffeners – splicing and connections.

**Design of Gantry Girder:** impact factors - longitudinal forces, Design of Gantry girders.

**NOTE:** Welding connections should be used in Units II – VI.

The students should prepare the following plates.

Plate 1 Detailing of simple beams

Plate 2 Detailing of Compound beams including curtailment of flange plates.

Plate 3 Detailing of Column including lacing and battens.

Plate 4 Detailing of Column bases – slab base and gusseted base

Plate 5 Detailing of steel roof trusses including joint details.

Plate 6 Detailing of Plate girder including curtailment, splicing and stiffeners.

**INTERNAL EXAMINATION PATTERN:**

The total internal marks (30) are distributed in three components as follows:

1. Descriptive (subjective type) examination : 25 marks
2. Assignment : 05 marks

**FINAL EXAMINATION PATTERN:**

The end examination paper should consist of Part A and Part B. Part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

**TEXT BOOKS**

1. ‘Steel Structures Design and Practice’ by N.Subramanian, Oxford University Press.
2. ‘Design of Steel Structures’ by Ramachandra, Vol – 1, Universities Press.
3. ‘Design of steel structures’ by S.K. Duggal, Tata Mcgraw Hill, and New Delhi

**REFERENCES**

1. ‘Structural Design in Steel’ by Sarwar Alam Raz, New Age International Publishers, New Delhi
2. ‘Design of Steel Structures’ by P. Dayaratnam; S. Chand Publishers
3. ‘Design of Steel Structures’ by M. Raghupathi, Tata Mc. Graw-Hill
4. ‘Structural Design and Drawing’ by N. Krishna Raju; University Press,

**IS Codes:**

- 1) IS -800 – 2007
- 2) IS – 875
- 3) Steel Tables.

These codes and steel tables are permitted to use in the examinations.

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