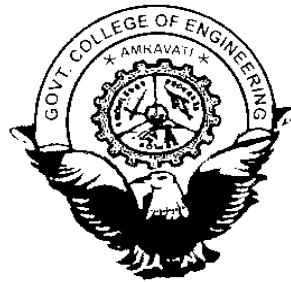


# **GOVT. COLLEGE OF ENGINEERING, AMRAVATI**



## **B. TECH. (CIVIL) V and VI Semester CURRICULUM**

**Department of Civil Engineering  
2009-10**

**Govt. College of Engineering, Amravati**  
**Department of Civil Engineering**  
**Third Semester**

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory				Practical		Total	
						TA	CT1	CT2	ESE	Internal	External		
CE301	Mathematics-III	4	1	-	5	10	15	15	60	-	-	100	5
CE302	Strength of Materials	4	1	-	5	10	15	15	60	-	-	100	5
CE303	Engineering Geology	2	-	-	2	4	8	8	30	-	-	50	2
CE304	Construction Materials	2	-	-	2	4	8	8	30	-	-	50	2
CE305	Building Construction	4	-	-	4	10	15	15	60	-	-	100	4
CE306	Fluid Mechanics-I	3	1	-	4	10	15	15	60	-	-	100	4
CE307	General Profeciency-I	-	-	2	2	-	-	-	-	50	-	50	1
CE308	Strength of Materials-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE309	Engineering Geology - Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE310	Building Construction -Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE311	Fluid Mechanics-I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	19	3	10	32							750	27

Note: The ESE duration for all courses shall be 2 hrs. 30 min. except courses CE303 and CE 304 for which the ESE duration will be 2 hrs.

**Fourth Semester**

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory				Practical		Total	
						TA	CT1	CT2	ESE	Internal	External		
CE401	Economics & Humanities	4	0	-	4	10	15	15	60	-	-	100	4
CE402	Water Resource Engg-I	3	1	-	4	10	15	15	60	-	-	100	4
CE403	Fluid Mechanics II	4	1	-	5	10	15	15	60	-	-	100	5
CE404	Concrete Technology	3	1	-	4	10	15	15	60	-	-	100	4
CE405	Surveying I	4	1	-	5	10	15	15	60	-	-	100	5
CE406	General Profeciency-II	-	-	2	2	-	-	-	-	50	-	50	1
CE407	Fluid Mechanics II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE408	Concrete Technology-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE409	Surveying I-Lab	-	-	4	4	-	-	-	-	50	50	100	2
	Total	18	4	10	32							750	27

Note: The ESE duration for all courses shall be 2 hrs. 30 min.

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**Fifth Semester**

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory				Practical		Total	
						TA	CT1	CT2	ESE	Internal	External		
CE501	Theory of Structure I	4	1	-	5	10	15	15	60	-	-	100	5
CE502	Design of Reinforced Concrete Structures	3	1	-	4	10	15	15	60	-	-	100	4
CE503	Geotechnical Engineering -I	4	1	-	5	10	15	15	60	-	-	100	5
CE504	Surveying II	3	1	-	4	10	15	15	60	-	-	100	4
CE505	Building Design & Drawing	2	0	-	2	10	15	15	60	-	-	100	2
CE506	Computer Application in Civil Engineering-Lab	-	-	2	2	-	-	-	-	50	-	50	2
CE507	Design of Reinforced Concrete Structures-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE508	Geotechnical Engineering -I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE509	Surveying II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE510	Building Design & Drawing-Lab	-	-	4	4	-	-	-	-	25	25	50	2
	Total	16	4	12	32							750	27

Note: The ESE duration for all courses shall be 2 hrs. 30 min. except courses CE502 and CE505 for which the ESE duration will be 3 hrs.

**Sixth Semester**

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory				Practical		Total	
						TA	CT1	CT2	ESE	Internal	External		
CE601	Design of Steel Structures	3	1	-	4	10	15	15	60	-	-	100	4
CE602	Geotechnical Engineering -II	4	1	-	5	10	15	15	60	-	-	100	5
CE603	Environmental Engineering-I	4	0	-	4	10	15	15	60	-	-	100	4
CE604	Transportation Engineering-I	3	1	-	4	10	15	15	60	-	-	100	4
CE605	Estimating & Costing	3	1	-	4	10	15	15	60	-	-	100	4
CE606	Minor Project	-	-	2	2	-	-	-	-	25	25	50	2
CE607	Design of Steel Structures-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE608	Geotechnical Engineering -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE609	Transportation Engineering-I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE610	Estimating & Costing-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	17	4	10	31							750	27

Note: The ESE duration for all courses shall be 2 hrs. 30 min. except courses CE601 and CE 605 for which the ESE duration will be 3 hrs.

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**Seventh Semester**

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE701	Elective -I	3	1	-	4	10	15	15	60	-	-	100	4
CE702	Theory of Structure -II	3	1	-	4	10	15	15	60	-	-	100	4
CE703	Construction Management	3	1	-	4	10	15	15	60	-	-	100	4
CE704	Water Resource Engg. -II	3	1	-	4	10	15	15	60	-	-	100	4
CE705	Environmental Engg-II	3	1	-	4	10	15	15	60	-	-	100	4
CE706	Project & Seminar	-	-	4	4	-	-	-	-	50	-	50	3
CE707	Elective -I-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE708	Theory of Structure -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE709	Water Resource Engg. -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE710	Environmental Engg-II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	15	5	12	32							750	27

Note: The ESE duration for all courses shall be 2 hrs. 30 min. except course CE702 for which the ESE duration will be 3 hrs.

**Eighth Semester**

Corse Code	Name of the Course	Teaching Scheme				Evaluation System							Credits
						Theory				Practical		Total	
		Theory Hrs/week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
CE801	Elective -II	3	1	-	4	10	15	15	60	-	-	100	4
CE802	Elective -III	3	1	-	4	10	15	15	60	-	-	100	4
CE803	Advance Structural Design	3	1	-	4	10	15	15	60	-	-	100	4
CE804	Transportation Engg-II	3	-	-	3	10	15	15	60	-	-	100	3
CE805	Project & Seminar	-	-	4	4	-	-	-	-	100	100	200	9
CE806	Elective -II-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE807	Elective -III-Lab	-	-	2	2	-	-	-	-	25	25	50	1
CE808	Advance Structural Design-Lab	-	-	2	2	-	-	-	-	25	25	50	1
	Total	12	3	10	25							750	27

Note: The ESE duration for all courses shall be 2 hrs. 30 min. except course CE 803 for which the ESE duration will be 3 hrs.

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Sr. no.	Elective I	Sr. no.	Elective II	Sr. no.	Elective III
1	Structural Dynamics	1	Earthquake Resistant Design	1	Adv. Hydraulic Structures
2	Advance Geotechnical Engineering	2	Adv. Structural Analysis	2	Adv. Design of Steel Structure
3	Matrix Analysis of Structures	3	Pavement Design & Construction	3	Finite Element Methods
4	Water Treatment Process & Technology	4	Adv. Waste Water Treatment	4	Ground Improvement Technology
5	Traffic Engineering & Control	5	Adv. Foundation Engineering	5	GIS & Remote Sensing
6	Advance Hydraulics	6	Adv. Construction Management	6	Environmental Pollution & Soild Waste Management

## CE 501- THEORY OF STRUCTURES – I

**Teaching Scheme : 04 L + 01 T Total = 05**

**Credits: 05**

**Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE**

**Total Marks: 100**

**Duration of ESE: 2hrs.30 min.**

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Classification of Structures, Concept of statically indeterminate beam and frame, Analysis of fixed beam and propped cantilever, Rotation and sinking of support. Analysis of Continuous beam by theorem of three moments, sinking of support.

Castigliano's theorem for slope and deflection, Unit load method, slope and deflection in determinate beams and portals.

Deflection in determinate trusses.

Influence line diagrams for reactions, bending moment and shear force for determinate beams.

Rolling loads on simply supported beams, concentrated and uniformly distributed loads, maximum shear force and bending moment, absolute maximum shear force and bending moment

Rolling loads on trusses, Influence line diagrams for forces in members of simple trusses. Three hinged arches subjected to static loads, Bending moment, radial shear and axial thrust.

Slope deflection method: Analysis of continuous beams with and without sinking of support. Analysis of portal frames without side sway.

Moment Distribution method: Analysis of continuous beams with and without sinking of support and portal frames without side sway.

### **Text Books:**

1. Basic Structural Analysis, Reddy C. S., 2<sup>nd</sup> edition, Tata – McGraw Hill, New Delhi, 2004.
2. Intermediate Structural Analysis, Wang, C. K., International Edition, McGraw Hill Inc, 1983

### **Reference Books:**

1. Elementary Structural Analysis, Utku, Norris and Wilbur, 4<sup>th</sup> Edition, McGraw Hill Inc, 1991
2. Structural Analysis, R.C. Hibbler, 4<sup>th</sup> Edition, Prentice Hall, 1999

## **CE502 DESIGN OF REINFORCED CONCRETE STRUCTURES**

**Teaching Scheme : 03 L + 01 T Total = 04**

**Credits: 04**

**Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE**

**Total Marks: 100**

**Duration of ESE: 3hrs.**

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Concept of reinforced concrete, History of RCC, Role of structural design in RCC structures, materials, properties. Design considerations, Basic elastic theory (Working Stress Method)

Limit state method, comparison with working stress method, Modes of failure, Analysis at ultimate Limit state in flexure, basic concept of singly reinforced and doubly reinforced sections.

Analysis and design of one way single span slab and continuous slabs. Analysis and design of two way slab. Design of stairs -Doglegged type.

Analysis and design of beams, rectangular and flanged sections for bending moment and shear.

Analysis and design of columns, for axial, uni-axial and biaxial bending.

Design of isolated footings, square and rectangular subjected to axial load and bending moment (uniform depth only)

Complete design of simple small structures like canopies & parking sheds.

### **Text Books:**

1. Limit State Design of Reinforced Concrete, Varghese P.C., 2<sup>nd</sup> Edition, Prentice – Hall of India Pvt. Ltd, New Delhi, 2002
2. Fundamentals of Reinforced Concrete, Sinha S.K and Roy S.K, Tata McGraw Hill, New Delhi, 2002

### **Reference Books:**

1. Advanced Reinforced Concrete Design, Varghese P.C., Prentice – Hall of India Pvt Ltd, New Delhi.
2. Design of Concrete Structures, Nilson A. H., Darwin D. and Dolan C. W., Tata McGraw Hill, New Delhi
3. Reinforced Concrete Design, Pillai S. U. and Menon D., 2<sup>nd</sup> Edition, Tata McGraw Hill, New Delhi, 2003.
4. BIS 456-2000, Plain and Reinforced Concrete - Code of Practice, BIS, NewDelhi
5. BIS 875-1987 (Part I to V), Code of Practice for Design Loads (other than earthquake)for Buildings and Structures, BIS, NewDelhi

## CE503- GEOTECHNICAL ENGINEERING - I

**Teaching scheme : 04 L + 01 T Total = 05**

**Credits: 05**

**Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE**

**Total Marks: 100**

**Duration of ESE: 2hrs.30 min.**

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Introduction to Soil and Soil Mechanics, Civil Engineering problems related to soils, Complexity of soil nature, Soil formation and soil types, Regional soil deposits of India, Names of some common soils that are used in practice.

Index properties of soil: Soil- a three-phase system, Solids-water-air relationships, water content, void ratio, porosity, degree of saturation, unit weight, specific gravity, their inter-relationships, Laboratory determination of water content by oven drying method, pycnometer method, torsion balance moisture meter method, In-situ determination of density by core cutter method and sand replacement method, Determination of specific gravity by density bottle and pycnometer method, Relative density, Grain shapes, Grain size distribution by sieve analysis, grain size distribution curve, Consistency of clays. Atterberg's limits and indices, Determination of consistency limits as per IS code, significance of consistency limits and indices.

Classification of soils: Necessity of classification, criteria for classification, classification based on grain size and plasticity, textural classification, Indian standard classification system, classified soils and its engineering properties.

Soil compaction: Necessity of compaction in field, Standard Proctor test, Modified Proctor test, compaction curve, OMC and Maximum dry density, Compaction curve for sand, factors affecting compaction, structure and engineering behaviour of compacted soil, Compaction in field, suitability of various compaction equipment, placement water content, compaction specification and field control.

Permeability: Permeability, Darcy's law, methods of determination of coefficient of permeability of soils – constant head and falling head permeability tests, factors affecting permeability, approximate coefficient of permeability of common soils, field permeability tests-pumping out and pumping in tests.

Seepage analysis: Seepage pressure, upward flow, quick condition, two-dimensional Laplace equation, Flow net and its properties, graphical method of flow net construction, determination of seepage by flow net, seepage force, phreatic line, Filters, graded filters, criteria for design of filters.

Shear strength of soil: Basic concept of shearing resistance and shearing strength, concept of failure, Coulomb's criteria of failure, failure envelope, components of shear strength of soil, cohesion and angle of internal friction, Mohr's circle of stress, Major and minor principal planes and stresses, determination of normal and shear stress on a given plane, shear strength equation in terms of principal stresses, Determination of shear strength of soil in laboratory – Unconfined compression test, Direct shear test, Tri-axial shear test, Laboratory vane shear test, their suitability, stress conditions in soil during test, effective stress, stress condition at failure in terms of total stresses and effective stresses, relationship among stresses at failure.

Consolidation: The consolidation process, spring analogy, consolidation of laterally confined soil, Terzaghi's theory of one-dimensional consolidation (no derivation), solution of the consolidation equation, Laboratory consolidation test, determination of coefficient of consolidation, square root time fitting method, logarithm of time fitting method, coefficient of compression, coefficient of volume change, consolidation settlement, consolidation of undisturbed specimen, determination of pre-consolidation pressure.

Stress Distribution: State of stress at a point, stress distribution in soil mass, Boussinesq theory and its applications, pressure distribution diagrams, contact pressure

**Text Books:**

1. Geotechnical Engineering, Murthy V. N. S., Marcel Dekker Inc., New York, 2003.
2. Geotechnical Engineering, Principals and Practices, Coduto D. P., 1<sup>st</sup> Edition, Prentice Hall of India Pvt., Ltd., New Delhi, 1999.

**Reference Books:**

1. Soil Mechanics and Foundations, Muniram Budhu, 2<sup>nd</sup> Edition, Wiley Publishers, 2006.
2. Geotechnical Engineering, Gulhati S. K. and Datta M., 1<sup>st</sup> Edition, Tata MC Graw Hill Publishing Company, New Delhi, 2005.
3. Soil Mechanics, Craig R. F., 7<sup>th</sup> Edition, Chapman & Hall, 2004.
4. SP: 36 (Part 1), Compendium of Indian Standards on Soil Engineering, Part 1, BIS New Delhi, 1988

## **CE504- SURVEYING - II**

**Teaching Scheme : 03L + 01 T Total = 04**

**Credits: 04**

**Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE**

**Total Marks: 100**

**Duration of ESE: 2hrs.30 min.**

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Theodolite Traversing: Selection of traverse station, linear & angular measurements, Methods of traversing - fast needle method, included angle method, direct angle method, deflection angle method. Locating details in a Theodolite traverse, angle mis-closure, balancing the angles of the traverse, Latitudes and departure and its computation, Consecutive & independent co-ordinates, Gales Traverse table, checks in a closed traverse & an open traverse, error of closure.

Total Station Traversing: Selecting a job, scale factor setting, azimuth angle setting, entering instrument station data, recording back sight point, recording angle measurement data, recording distance measurement data, recording notes, calculating azimuth angle by coordinates, coordinate resection measurement, height resection measurement, offset measurement, single distance measurement, angle offset measurement, two-distance offset measurement, registering known point data, reviewing known point data, reading in registered coordinate data, outputting job data to host computer,

Tacheometry: Purpose & advantages, Principle of Stadia methods, determination of Tachometric constants, Theory of analytic lens, fixed hair method and tangential method, formula for distance and reduced level, Tachometric survey, errors in Tacheometric surveying.

Curves: Classification, degree of curve, elements of simple circular curve, Theory & methods of setting out simple circular curves- chain & tape method , Instrumental method, obstacles in setting out curves,

Compound curve, theory and methods of setting out compound curves

Transition curve: Purpose, length of transition curve, Ideal transition curve, characteristics of transition curve, length of combined curve, methods of setting out combined curve – deflection angle method, tangent offset method. Spiraling compound curves.( No numerical)

Vertical curves: Types, properties, location of highest or lowest point, length of vertical curve, methods of setting out vertical curves

City Surveying: Control, equipment, topographic map, underground map, city property survey, location of details

Underground Surveying: Surface alignment, correlation of surface and underground surveys, transferring levels underground, underground bench marks, setting out of pipelines and sewers

Hydrographic Surveying: Necessity, control, shore line survey, river survey, gauges, sounding equipment and procedure of taking sounding, methods of locating sounding, three point problem- mechanical & graphical solutions

Remote Sensing: Introduction, definitions, remote sensing systems, advantages over conventional system, energy interaction in the atmosphere, Indian remote sensing satellite series and their characteristics, applications of remote sensing for survey works

Geographical Information System GIS & Global Positioning System (GPS): Components of GIS, advantages, functions of GIS, Raster and vector data, advantages and disadvantages, GPS, introduction, definitions, GPS receivers, antenna, advantages of GPS

**Text Books:**

1. Surveying & Leveling, Basak N., 1<sup>st</sup> Edition , Tata McGraw Hill, 2004.
2. Surveying Vol. I and II, Duggal S.K., 2<sup>nd</sup> Edition , Tata McGraw Hill, 2004.

**Reference Books:**

1. Surveying & Leveling Practice, Anderson J. M. and Mikhail E. M., 7<sup>th</sup> Edition, McGraw Hill, 1998
2. Surveying Principles and Applications, Kavanagh, 7<sup>th</sup> Edition, Prentice Hall, 2007
3. Surveying Fundamentals & Practices, Nathanson, Lanzafama and Kissam, 5<sup>th</sup> Edition, Prentice Hall, 2006
4. Surveying, Moffitt and Bossler, 10<sup>th</sup> Edition, Prentice Hall, 1998

## CE505- BUILDING DESIGN & DRAWING

**Teaching Scheme : 02 L + 00 T Total = 02**

**Credits: 02**

**Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE**

**Total Marks: 100**

**Duration of ESE: 3hrs.**

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Methods of Drawings: Importance of building drawing in construction & estimation, Method of drawing- Selection of scales for various drawings, types of lines, methods of dimensioning in architectural drawing. Abbreviations & graphical symbols used in Civil Engineering Drawing as per IS:962. Combined first angle & third angle method of projection, Layout of sheet for Civil Engineering drawing, Requirements of drawing as per plan sanctioning authorities, Perspective Drawing – one point perspective, two point perspective

Working Drawing: Concept of line plan & working drawings of the building, Developing working drawings of the building from the given line plan. Details to be incorporated in the working drawings, Necessity and use of working drawing, Site plan, Block plan, Layout plan, Foundation plan, Developing working drawing and foundation plan for load bearing and framed structures

Planning of residential building: Introduction, general principles of planning viz. aspect, prospect, roominess, privacy, grouping, circulation, ventilation, furniture requirement, Climate and design consideration, Orientation of buildings, requirement of the owner, alternatives of building types viz. individual bungalows, semi-detached houses, row houses, apartments. Provision of mezzanine floor, balconies and porches in the building, Common utilities such as parking, security, water supply, sanitation, etc. for apartments. Building rules and bye-laws for residential buildings, conversion of land to non-agricultural lands, layout for a housing project.

Planning of Public buildings: Types of public building and their requirements, planning of public buildings

### **Text books:**

1. Building Drawing, Shah M.G., Kale & Patki, Tata McGraw Hills Publishing Co., New Delhi
2. Architectural Working Drawings: Residential and Commercial Buildings, Spence William P., 1993

### **Reference books:**

1. IS: 962-1989, Code of practice for architectural and building drawings, BIS, New Delhi.
2. AutoCAD Workbook for Architects, Shannon Kyles, Wiley-Blackwell, July 2008
3. Construction Drawings and Details for Interiors: Basic Skills, Kilmer W. O. and Kilmer R., John Wiley & Sons, 2003

4. Architectural Graphic Standards for Residential Construction: The Architect's and Builder's Guide to Design, Planning, and Construction Details, The American Institute of Architects, John Wiley & Sons, 2003.

### **CE506- COMPUTER APPLICATIONS IN CIVIL ENGINEERING - LAB**

**Teaching Scheme: 02 P**

**Total = 02**

**Credit : 2**

**Evaluation Scheme: Internal = 50**

**Total Marks: 50**

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#### **List of Experiments**

Any ten of following experiments using MS-EXCEL / MATLAB

1. Preparing a leveling page of field book, entering the sights and working out reduced level and applying checks
2. Preparing measurement sheet, entering data and calculations of quantities
3. Preparing Abstract sheet entering data and calculating the cost of work
4. Entering data of road project/ irrigation project and calculation of quantities of earthwork
5. Entering the data of grain size analysis and plotting the particle size distribution curve
6. Entering the data of Proctor compaction test and plotting compaction curve.
7. Determining the dimensions of most economical channel section for given data
8. Plotting the hydrograph for given data
9. To find the moment of resistance of a singly reinforced beam for given data
10. Design of R.C.C. singly reinforced beam for given data
11. Design of R.C.C. one way / two way slab for given data
12. Design of R.C.C. column for given data
13. Plotting the SFD and BMD for given loading on a simply supported / cantilever beam
14. Plotting the stress-strain curve for M.S. Grade and Fe415 Grade Steel

A Lab Report based on above experiments shall be submitted by each student.

#### **Practical Examination:**

Practical examination shall consist of oral examination based on Lab Report.

### **CE507 DESIGN OF REINFORCED CONCRETE STRUCTURES - LAB**

**Teaching Scheme: 02 P**

**Total = 02**

**Credit : 1**

**Evaluation Scheme: Internal = 25; External = 25**

**Total Marks: 50**

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A Lab report & Structural drawings (using AutoCAD & manually) on Designs of different structural elements of a single storey building shall be submitted by each student.

Field visit on any RCC framed structure & submission of the report on site visit

**Practical Examination:**

Practical examination shall consist of oral examination based on Lab Report.

**CE508- GEOTECHNICAL ENGINEERING – I – LAB**

**Teaching Scheme: 02 P**

**Total = 02**

**Credit : 1**

**Evaluation Scheme: Internal = 25; External = 25**

**Total Marks: 50**

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**List of Experiments**

1. Determination of water content by oven drying method and torsion balance moisture meter method.
2. Determination of in-situ density of soil by core cutter method.
3. Determination of In-situ density of soil by sand replacement method.
4. Determination of specific gravity of soil by pycnometer method
5. Determination of Grain size distribution by sieve analysis
6. Determination of plastic limit, liquid limit and plasticity index of soil.
7. Determination of shrinkage limit of soil.
8. Determination of compaction properties of soil by Standard Proctor test.
9. Determination of coefficient of permeability of soils by constant head / falling head permeability tests,
10. Determination of consolidation characteristics of soil by conducting one dimensional consolidation test.
11. Determination of shear strength of soil by unconfined compression test.
12. Determination of shear strength of soil by Direct shear test.
13. Determination of shear strength of soil by Tri-axial shear test (Quick test)
14. Determination of shear strength of soil by Laboratory vane shear test.
15. Determination of C.B.R value of given soil sample.

A Lab Report based on above experiments shall be submitted by each student.

**Practical Examination:**

Practical examination shall consist of oral examination based on Lab Report.

**CE509 - SURVEYING – II - LAB**

**Teaching Scheme: 02 P**

**Total = 02**

**Credit : 1**

**Evaluation Scheme: Internal = 25; External = 25**

**Total Marks: 50**

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**List of Experiments**

1. Theodolite traversing – selection of stations, measurement of internal angles by theodolite, traverse calculations, traverse adjustment by Gales traverse table, recording details by perpendicular offsets, Plotting the corrected traverse and details on A1 size drawing sheet.

2. Total Station traversing – Selecting a job, entering instrument station data, recording back sight point, recording angle measurement data, recording distance measurement data, offset measurement, outputting job data to host computer and taking out printouts
3. Finding out tacheometric constants of given tacheometer
4. Finding out horizontal and vertical distance of a given point from the instruction station using tacheometer
5. Finding out horizontal and vertical distance between two given points using tachometer
6. Setting out simple circular curves by offset from long chord method.
7. Setting out simple circular curves by offset from tangents
8. Setting out simple circular curves by deflection angles – single theodolite method
9. Setting out simple circular curves by deflection angles – Two theodolite method

A Lab Report based on above experiments shall be submitted by each student.

**Practical Examination:**

Practical examination shall consist of oral examination based on Lab Report.

**CE510- BUILDING DESIGN & DRAWING - LAB**

<b>Teaching Scheme: 04 P</b>	<b>Total = 04</b>	<b>Credit : 2</b>
<b>Evaluation Scheme: Internal = 25; External = 25</b>		<b>Total Marks: 50</b>

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**PART 1 – MANUAL DRAWING**

Developing following drawings on full imperial size sheets:

1. Developing working drawing of single storied residential building from the given line plan. (Load bearing structure)
2. Preparing line plan of residential building from the given data on the graph paper and developing its submission drawings as per requirement of the plan sanctioning authority (Framed structure) ( Separate data should be given to group of students)
3. Developing line plans of public building from the given data ( minimum 2 line plans to be drawn graph papers)
4. Sketch book containing at least 10 free hand sketches of building components and elevational features such as balconies, sun shades and sun breakers, grills, compound gates, grill doors, door panel designs, window frame design, etc.

**PART 2 – CAD DRAWING**

**1.AutoCAD commands**

Elements of Drawing Editor Screen, Basic drawing entities  
 Drawing commands – Point, Line, Rectangle, Arc, Hatch, Text, Table,  
 Use of Osnap  
 Dimensioning – Linear, aligned, continue dimensioning

Formatting – point style, line weight, line types, colour, text style, dimension style, table style, units  
Editing commands – selecting objects, various methods of selection, Erase, Move, Copy, Break, Mirror, Rotate, Scale, Trim, Extend, Offset  
Blocks- making and inserting blocks  
Zooming and Panning  
Saving & Printing the drawing – selection of scale

## **2.AutoCAD Drawings**

Creating Working Drawings in AutoCAD of single storied residential building from the given line plan same as in exercise 1 of Part I and taking printouts

A Lab Report based on above experiments shall be submitted by each student.

### **Practical Examination:**

Practical examination shall consist of oral examination based on Lab Report.

## **CE 601 DESIGN OF STEEL STRUCTURES**

**Teaching Scheme : 03 L + 01T Total = 04**

**Credits: 04**

**Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE**

**Total Marks: 100**

**Duration of ESE: 3hrs.**

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Introduction to Structural steel, standard steel sections, loads & stresses, Design of welded and riveted connections, axially & eccentrically loaded

Design of Tension and compression members, Design of simple and compound columns - axially & eccentrically loaded, Design of lacing and battening, Design of column splicing

Design of column bases, Gusseted base and solid slab base for axial & eccentric loading.

Design of beams, simple and compound beams. Beam column Design of Beam connections-welded and riveted.

Design of welded plate girder, curtailment of flange plates, design of stiffeners and web splicing.

Analysis and Design of Roof trusses & purlins.

### **Text books**

1. Design of Steel Structures, Raghupati, 1<sup>st</sup> Edition, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2001
2. Design of Steel Structures, S.K.Duggal, 2<sup>nd</sup> Edition, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2000.

### Reference books

1. Design of Steel Structures, Dayaratnam P., A. H. Wheeler and Co. Ltd., 1990.
2. Design of Steel Structures, Negi L., 2<sup>nd</sup> Edition, Tata McGraw Hill Publishing Company Ltd, New Delhi, 1999.
3. BIS 800-1984, Code of practice for general construction in steel, BIS New Delhi
4. BIS 875-1987 (Part I to V), Code of Practice for Design Loads (other than earthquake)for Buildings and Structures, BIS, NewDelhi
5. SP 6( Part I to Part 6) Handbook for structural engineers - Structural steel sections, 1964.

## CE602 - GEOTECHNICAL ENGINEERING - II

**Teaching Scheme : 04 L + 01 T Total = 05**

**Credits: 05**

**Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE**

**Total Marks: 100**

**Duration of ESE: 2hrs.30 min.**

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Soil exploration, planning, objectives and methods of exploration, soil boring, spacing and depth of boring, boring log, hand augers, wash boring, percussion drilling, rotary drilling, Type of samples and samplers, area ratio, inside and outside clearance, Soil investigation report

Field Tests: Plate load test, Standard Penetration test (SPT) , Static Cone Penetration Test (SCPT) and Dynamic Cone Penetration Test (DCPT), Field California Bearing Ratio test, Field vane shear test, geophysical methods such as electrical resistivity and soil refraction methods.

Bearing Capacity: Bearing capacity, its criteria, factors and various methods. Analytical Methods: Terzaghi's, Skempton's, Meyerhoff, BIS method for bearing capacity, Effect of water table, contact pressure distribution diagram below the base of footing. Bearing capacity based on plate load test results, SPT value, SCPT test results, Pressuremeter test,

Settlement: Evaluation of soils settlement : immediate, primary and secondary settlement for footing resting on homogenous, isotropic, cohesive and cohesionless soils related to single footing, combined footing, raft foundation etc, concept of differential settlement, factors and causes for differential settlement, standard requirement of total as well as differential settlement, service loads, proportioning of footing for uniform settlement.

Pile foundation : Classification of piles and their uses, static analysis, formula for determination of pile capacity for driven and bored pile in sand and in clay, dynamic pile formula, Negative skin friction, factor affecting it, piles in groups and their capacity, group efficiency, factors affecting group efficiency, settlement ratio, behaviour of group of pile in sandy and in clayey solids, pile load test, effect of pile cap. Criteria for spacing and depth of piles. IS design criterion for under-reamed pile in clay and sands, Total and differential settlement related to single pile and group of piles in sandy and in clays soils.

Well foundation: Component and their function, sinking of well, types of force system, and their computation, design criteria for various components of wells, tilting and shifting of wells, methods of correcting tilting and shifting. Bearing capacity of well foundation as per IS method.

Cofferdam: Its purpose, various types, their suitability.

Raft foundation: Its purpose, advantages, situation, classification of raft, criteria for rigid and flexible raft, design of raft foundation, concept of floating foundation.

Slope Stability: Slopes, uses and failure of slope, stability analysis of infinite and finite slope in sand, clay and  $c-\phi$  soil; Tailors stability number, Swedish circle method, Friction circle method, Bishop Method, Concept of effective stress analysis.

Earth Pressure: Earth Pressure at rest, active and passive, Stages of plastic equilibrium Rankin's and Coulombs theory of active and passive earth pressure on retaining wall. Influence of surcharge, water table, wall friction, Rebhann and Culmanns simple graphical methods

Ground Improvement: Methods of soil stabilization use of admixture (lime, cement, fly ash) in stabilization, Basic concept of reinforced soil, use of Geosynthetics material as a reinforcement, Vibro-flotation, sand column / stone column, preloading.

**Text Books:**

1. Geotechnical Engineering, Murthy V. N. S., Marcel Dekker Inc., New York, 2003.
2. Principal of Foundation Engineering, Das B. M., 5<sup>th</sup> Edition, Thomson Brooks/Cole, 2004

**Reference Books:**

1. Foundation Analysis and Design, Bowles J.E., 5<sup>th</sup> Edition, McGraw Hill International, 1996.
2. Foundation Design & Construction, Tomlinson, M. J., 7<sup>th</sup> Edition, Addison-Wesley Longman Ltd, 2001.
3. Design Aids in Soil Mechanics and Foundation Engineering, Kaniraj, R, 1<sup>st</sup> edition, Tata McGraw Hill, New Delhi, 2004.
4. SP: 36 (Part 2), Compendium of Indian Standards on Soil Engineering, Part 2, BIS New Delhi, 1988.

**CE 603 – ENVIRONMENTAL ENGINEERING – I**

**Teaching Scheme : 04 L                      Total = 04                      Credits: 04**  
**Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE                      Total Marks: 100**  
**Duration of ESE: 2hrs.30 min.**

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Sources of water: Surface water, Ground water, Infiltration galleries and their relative suitability; intake works, function, Types

Water quality: Impurities in water: Colour, Turbidity, pH, Chlorides, Hardness, Suspended solids, Dissolved solids, Residual Chlorine, Fluoride, MPN, Significance, Water quality standards

Demand of water: Water demand for domestic purposes, Fire demand, Per capita demand, Factors affecting consumption, Fluctuation in demand: Design period for water supply components, Population forecast: Arithmetical increase, Incremental increase, Geometrical increase, and Logistic curve methods  
Transmission lines: Function, Hydraulic formulae: Hazen-Williams equation, Darcy Weisbach equation, Optimum diameter of transmission line

Distribution system: Types of distribution system: Continuous and intermittent supply systems, Gravity, Pumping and combined systems; Layout of distribution system: Dead end, Grid iron, Circular, and Radial systems; Design of hydraulic network: Residual pressures, Hardy Cross method, Equivalent pipe method

Service Reservoirs: Elevated service reservoir, Balancing reservoir, Necessity, Location, Capacity calculation by Arithmetic & Mass curve method; Types of pipes, Types of valves, function and location

Water Treatment: Flow diagram of conventional WTP; Aeration: Principle, Purpose, Design of cascade aerator; Flash mixer, function, design, power requirement; Flocculation: Coagulants, quantity of coagulants, Design of mechanical flocculator; Sedimentation: Plain settling tank, design of settling tank, Surface over flow rate, Detention period; flow through velocity, weir loading, design of Clariflocculator

Filtration: Rapid and slow sand filters: Number of filter units, Filter media, Rate of filtration, Under drainage system, Backwashing, Negative head, Operation and cleaning, Design of rapid and slow sand filters, Design of under drainage system, Pressure filter

Disinfection: Objectives, Methods of disinfection, Chlorination: Free and combined chlorine, Effect of pH, Bleaching powder, Types of chlorination, Pre-chlorination, Post-chlorination, Break point chlorination, Super chlorination; Rural water supply: rate of water supply, treatment schemes, disinfection methods

Tertiary treatments: Softening: Lime soda, Quantity of lime and soda, Ion exchange; Effect of fluoride, Fluoridation and De-fluoridation

**Text Books:**

1. Environmental Engineering, Gerard Kiely, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.
2. Water Supply and Sewerage, McGhee T. J., 6<sup>th</sup> Edition, McGraw Hill Inc., New York, 1991

**Reference Books:**

1. Manual on Water Supply and Treatment, Central Public Health and Environmental Engineering Organization, Government of India Publication, New Delhi, 1993
2. Environmental Engineering, A. P. Sincer and G. A. Sincero, Prentice-Hall of India Private Limited, New Delhi, 2004.
3. Environmental Engineering, H. S. Peavy, D. R. Rowe and T. George, McGraw-Hill Book Company, New Delhi, 1985.
4. Water Supply and Waste Water Disposal, Fair G. M. and Geyer J. C., John Wiley and Sons, Inc., New York, 1954

**CE604- TRANSPORTATION ENGINEERING -I****Teaching Scheme : 03 L + 01 T Total = 04****Credits: 04****Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE****Total Marks: 100****Duration of ESE: 2hrs.30 min.**

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Importance of Transportation in Nation Development, Different modes of Transportation, Characteristics of Road Transport, Classification of Roads, Road Patterns

Highway Planning & Engineering Surveys: Necessity of Highway planning, Review of Highway development in India after independence, Indian Road Congress, Motor Vehicles Act, Central Road Research Institute, National Highway Act, Highway Research Board, National Transport Policy committee, Planning Surveys, Preparation of Plans, Preparation of Master plan and its phasing, Highway alignment- requirements and factors affecting, Engineering surveys for highway location, Drawings and reports, Stages in new Highway Project,

Highway Geometric Design: Importance of Geometric Design, Design controls and criteria, Highway cross sectional elements, Camber – Definition & purpose, IRC recommendations, methods of providing camber in field, Width of pavement or carriageway – definition, IRC recommendations, Kerbs – Types, Road Margins – shoulders, parking lanes, Footpaths, bus bays, Drive ways, cycle tracks, Width of roadway or Formation width – IRC recommendations, Right of way – Factors affecting, Typical cross sections of roads in cutting and banking, Sight distance – Stopping sight distance, overtaking sight distance, overtaking zones, Intermediate sight distance, sight distance at intersections, Super-elevation – Maximum and minimum super-elevation, Steps for super-elevation design, attainment of super-elevation in field, Widening of pavement on curves – IRC recommendations, Methods of introducing extra widening in field, Gradient – Ruling gradient, limiting gradient, exceptional gradient, minimum gradient, IRC recommendations, Vertical curves – Summit curves – Types and length, Valley curves – length, Typical cross section of Highway in cutting and filling

Highway Traffic Study: Traffic characteristics- road user characteristics, Vehicular characteristics, Traffic studies – traffic volume studies, speed studies, origin and

destination studies, traffic flow characteristics and studies, traffic capacity studies, accident studies, measures for reduction in accident rates.

Highway Materials and Testing: Stone aggregates- Desirable properties of road aggregates, Tests for road aggregates, Bituminous Materials – Bitumen, Tests on bitumen, cutback bitumen, Bituminous emulsions, Tar, Bituminous paving mixes, Design of bituminous mixes – Marshall method

Design of Highway Pavement: Object and requirement of pavement, Types of pavements, Pavement components and their functions, Design factors, Design wheel loads, Design of Flexible pavement by CBR method, Design of Rigid pavement, joints in rigid pavement

Construction of Highway: W.B.M. roads- specifications of materials, construction procedure, Bituminous pavements - Types of bituminous constructions, construction procedure for Surface Dressing, Penetration Macadam, Bituminous Macadam, Bituminous Concrete, Cement Concrete pavements - construction of pavement slab, construction of joints

Traffic Control Devices: Regulatory signs, Warning signs, Traffic signals – advantages and disadvantages, Types of traffic signals and signal system, Road markings – pavement markings, Kerb markings, object markings, Traffic islands, Road intersections, Grade separated intersections, Parking facilities

Highway Maintenance: Need for Highway maintenance, General causes of pavement failure, Pavement failures, Classification of maintenance works, Maintenance of W.B.M. roads, Bituminous surfaces and cement concrete pavements, Strengthening of existing pavements

Highway Drainage : Importance, Surface drainage, Sub-surface drainage

**Text books:**

1. Principles of Transportation Engineering, Chakroborty P. and Das A., Prentice Hall of India, 2003
2. Transportation Engineering: An Introduction, Khisty and Lall, 3<sup>rd</sup> Edition, Prentice Hall, 2003

**Reference books:**

1. Highway Engineering, Wright P. H. and Dixon C., 7<sup>th</sup> Edition, John Willey, 2004
2. Pavement Design and Materials, Papagiannakis A. T. and Masad E. A., 1<sup>st</sup> Edition, John Willey, 2008
3. Transportation Engineering and Planning, Costas P. and Prevedouros, 3<sup>rd</sup> Edition, Prentice Hall, 2001
4. Principles of Highway Engineering & Traffic Analysis, Mannering F. L., Walter P. K. and Scott John, 3<sup>rd</sup> Edition, Willey, 2004

## CE605 - ESTIMATING AND COSTING

Teaching scheme : 03 L + 01 T Total = 04

Credits: 04

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE

Total Marks: 100

Duration of ESE: 3hrs.

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Modes of Measurement and units of measurement as per IS1200, Types of Estimate, Various methods of estimate, Specification, purpose and principles of specification writing, Types of specification.

Cost Building up: purpose and principles, importance of schedule of rates in cost estimates, Rate analysis, factors affecting rate analysis, Task work, market rate analysis, Fixed, variable, prime and supplementary cost, overhead cost.

Cost and Quantity Estimate: Detailed Estimate, Forms used, Detailed estimates of various civil engineering structures, Working out quantities of various materials required for construction. Earth work estimates in roads including hill road.

Cost Accounting, various methods, classification of cost, direct and indirect charges, distribution of overheads, MAS account, issue rate of store accounts.

Valuation: Purpose of valuation, value and cost, market value, potential value, sentimental value, scrap value etc. Net and gross return, Free hold and lease hold property, Sinking fund, Depreciation, capitalized value, annualized value, methods of valuation, rent fixation, valuation of old building.

Organization of construction industry, Govt. organization, PWD organization, site administration, BOT, Role of Government department as a construction agency, Arranging contract works, methods of carrying out works, Contracts, types of contracts, Tender documents, Indian contract law and Engineering contracts, land acquisition, Act, Legal aspects of various contract provision.

### Text Books:

1. Estimating and Costing in Civil Engineering, Theory and Practice, Datta B.N., 23<sup>rd</sup> Edition, UBS Publisher, New Delhi, 2003
2. Estimating Building Cost, Popescu C. M., Phaobunjong Kan and Nuntapong Ovararin Dekker Publication

### Reference Book

1. Estimating and Costing, Patil B. S., Oriental Longmans Publication, New Delhi
2. National Building Code of India 2005, Group I to V, Bureau of Indian Standards, New Delhi

## CE606- MINOR PROJECT

**Teaching Scheme: 02 P**

**Total = 02**

**Credit : 2**

**Evaluation Scheme: Internal = 25; External = 25**

**Total Marks: 50**

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Students should conduct a detailed survey for five to seven days period in a survey camp at a suitable site for a civil Engineering Project for Data collection & analysis, related Design and submit the report and related drawings based on the project. Any one of the following group project may be selected:

- 1.Irrigation Project:** Tank basin survey, contour map, area-capacity curve
- 2.Water Supply Project:** Data collection for water requirement, selection of source, design of intake fixing alignment of rising main and profile leveling, design of rising main, selection of site for treatment plant, block contouring for treatment plant, fixing alignment of pure water rising main and profile leveling, fixing the location of ESR and block contouring of the site, survey for distribution network, design of distribution of network
- 3.Sewerage system project:** Data collection for sewage quantity, fixing alignment of sewers and profile leveling, design of sewers, selection of site for sewage treatment plant, block contouring for treatment plant, preliminary design
- 4.Bridge Project:** Hydrological Data collection for project, fixing the location of bridge, River survey at bridge site, preliminary design of bridge.
- 5. Road Project:** Road project of 1 km length including contouring, fixing alignment, design of curves, road geometric design, estimating quantity and cost of project.

## CE 607 DESIGN OF STEEL STRUCTURES -LAB

**Teaching Scheme: 02 P**

**Total = 02**

**Credit : 1**

**Evaluation Scheme: Internal = 25; External = 25**

**Total Marks: 50**

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A Lab report & Structural drawings (using AutoCAD & manually)on Designs of different structural elements of a single storey industrial structure shall be submitted by each student.

Field visit on Steel Structure / Industrial Building / Railway Station / Bridges / Plate Girders and submission of the report.

### **Practical Examination:**

Practical examination shall consist of oral examination based on Lab Report.

## **CE608 - GEOTECHNICAL ENGINEERING – II- LAB**

**Teaching Scheme: 02 P      Total = 02**  
**Evaluation Scheme: Internal = 25; External = 25**

**Credit : 1**  
**Total Marks: 50**

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### **List of Experiments:**

To identify the subsoil strata by conducting soil resistivity / seismic refractivity method.

1. To determine the soil characteristic by conducting standard penetration test / static cone penetration test.
2. To determine the bearing capacity of soil by conducting standard penetration test.
3. To determine the bearing capacity by plate load test.
4. To determine the characteristic with respect to soil log bore presentation and interpretation of exploration.
5. Determining allowable bearing capacity for shallow foundation for a given data.
6. Design of a pile foundation for a given data.
7. Determination of earth pressure by graphical method.
8. Slope stability analysis by graphical method.
9. Design of raft foundation for a given data.
10. Field visit to construction site where work is at foundation level or for field test

A Lab Report based on above experiments shall be submitted by each student.

### **Practical Examination:**

Practical examination shall consist of oral examination based on Lab Report.

## **CE609- TRANSPORTATION ENGINEERING -I- LAB**

**Teaching Scheme: P - 02      Total = 02**  
**Evaluation Scheme: Internal = 25; External = 25**

**Credit : 1**  
**Total Marks: 50**

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### **List of Experiments:**

1. Aggregate crushing strength test.
2. Los Angeles abrasion test / Deval abrasion test.
3. Aggregate impact test.
4. Aggregate Shape test – Flakiness index and elongation index determination.
5. Aggregate Bitumen adhesion test
6. Penetration test on bitumen.
7. Ductility test on bitumen.
8. Viscosity test on bitumen.
9. Softening point test on bitumen,
10. Flash and fire point test on bitumen.
11. Determination of Marshall Stability Value.

A Lab Report based on above experiments shall be submitted by each student.

**Practical Examination:**

Practical examination shall consist of oral examination based on Lab Report.

**CE610 - ESTIMATING AND COSTING - LAB**

**Teaching Scheme: P - 02**

**Total = 02**

**Credit : 1**

**Evaluation Scheme: Internal = 25; External = 25**

**Total Marks: 50**

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A Lab Report based on following shall be submitted by each student.

1. Specification for TEN items (Building works –6 items, road work –2 items, irrigation work –2 items).
2. Detailed estimate of a building, single storied with minimum four rooms with flat roof (Given problem)
3. Detailed estimate of road of minimum 1 km length with hot mix coat.
4. Detailed estimate of any two of the following: a) Septic tank for a colony b) R.C.C framed structure residential building c) Culvert
5. Analysis of Rates for EIGHT items.
6. Problem of valuation of existing residential building.
7. Submission of detailed estimate of building using Qe-Pro software.
8. Tender documents for the problem no 2

**Practical Examination:**

Practical examination shall consist of oral examination based on Lab Report.