UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2013 SCHEME)

SYLLABUS FOR

V SEMESTER

CIVIL ENGINEERING

SCHEME -2013

V SEMESTER
CIVIL ENGINEERING (C)

Course No	Name of subject	Credits	Weekly load, hours			C A Marks	Exam Duration Hrs	U E Max Marks	Total Marks
			L	T	D/ P				
13.501	Engineering Mathematics - IV (BCHMPSU)	4	3	1	-	50	3	100	150
13.502	Environmental Engineering I (C)	4	3	1	-	50	3	100	150
13.503	Structural Analysis II (C)	5	4	1	-	50	3	100	150
13.504	Geotechnical Engineering I (C)	4	3	1	-	50	3	100	150
13.505	Transportation Engineering I (C)	4	3	1	-	50	3	100	150
13.506	Water Resources Engineering (C)	4	3	1		50	3	100	150
13.507	Practical Surveying II (C)	2	-	-	2	50	3	100	150
13.508	Concrete Lab. (C)	2	-	-	2	50	3	100	150
	Total	**29**	**19**	**6**	**4**	**400**		**800**	**1200**

13.501 ENGINEERING MATHEMATICS - IV (BCHMPSU)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objective:

- *To provide a basic understanding of random variables and probability distributions.*
- *Mathematical programming techniques are introduced as a part of this course. These techniques are concerned with the allotment of available resources so as to minimize cost or maximize profit subject to prescribed restrictions.*

Module – I

Random Variables -Discrete and continuous random variables and their probability distributions-Probability distribution (density) functions - Distribution functions - mean and variance-simple problems-
Binomial distribution, Poisson distribution, Poisson approximation to Binomial, Uniform distribution, Exponential Distribution, Normal distribution - mean and variance of the above distributions(derivations except for normal distribution) - Computing probabilities using the above distributions.

Module – II

Curve fitting - Principle of least squares - Fitting a straight line – Fitting a parabola-Linear correlation and regression - Karl Pearson's coefficient of correlation - Sampling distributions - Standard error –Estimation - Interval estimation of population mean and proportions(small and large samples)- Testing of hypothesis - Hypothesis concerning mean - Equality of means - Hypothesis concerning proportions- Equality of proportions.

Module – III

Linear programming - Formation of LPP - General linear programming problem - Slack and surplus variables - Standard form - Solution of LPP - Basic solution - Basic feasible solution - Degenerate and non-degenerate solutions - Optimal solution - Solution by simplex method - Artificial variables - Big-M method.

Module – IV

Duality in LPP - Properties of primal and dual optimal solutions - solution using duality- Transportation problem and Assignment problem.

References:

1. Veerarajan, T., *Probability, Statistics and Random Processes,* 3/e, Tata McGraw Hill, 2002.

2. Papoulis A. and S. U. Pillai, *Probability, Random Variables and Stochastic Processes*, 3/e, Tata McGraw Hill, 2002.
3. Koneru S. R., *Engineering Mathematics*, 2/e, Universities Press (India) Pvt. Ltd., 2012.
4. Bali N. P. and M. Goyal, *Engineering Mathematics*, 7/e, Laxmi Publications, India, 2012.
5. Kreyszig E., *Advanced Engineering Mathematics*, 9/e, Wiley India, 2013.
6. Swarup, K., P. K. Gupta and Manmohan, *Operations Research*, 6/e, Sulthan Chand and Sons, 1978.
7. Sharma S. D. and H. Sharma, *Operations Research: Theory, Methods and Applications*, 13/e, Kedar Nath and Ram Nath, 1972.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of this course, the students will be familiar with the large scale applications of linear programming techniques which require only a few minutes on the computer. Also they will be familiar with the concepts of probability distributions which are essential in transportation engineering.

13.502 ENVIRONMENTAL ENGINEERING – I (C)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objectives:

- *At the first phase of the course delivery, student will obtain primary understanding about the suspended and colloidal impurities in drinking water and the procedure for removing it*
- *In the second phase, student will identify the significance of filtration, disinfection, systems of distribution of water and develop an idea about the functioning of all units of a conventional water treatment plant*
- *In the third phase of course delivery, student will identify how the water demand of a community is scientifically assessed and distribution systems and its capacities were designed*
- *In the last phase, student will obtain additional information on the advanced water treatment techniques including the removal of inorganic impurities from drinking water*

Module – I

Quality of water- Drinking water standards- Impurities of water-treatment of water-Principles of sedimentation-stokes law-discrete particle settling and flocculent settling-ideal sedimentation tanks-design of rectangular and circular clarifiers-colloidal dispersions-purpose and action of coagulants-mechanism of coagulation-flocculation-clariflocculators-design of circular clariflocculators.

Module – II

Theory of filtration-working of rapid gravity filters-operational troubles-design of rapid gravity filters-Disinfection of water-Chlorination-Factors affecting Chlorination-Chlorine demand-issues of chlorination- Aeration-Removal of fluoride and arsenic from drinking water-systems of water distribution – patterns of water distribution networks- layout of conventional water treatment plant.

Module – III

Quantification of water demand for a community through population forecasting – Factors affecting consumption-Fluctuations in demand- mass curve-capacity of service reservoirs-River intakes- pumps-design of pumping capacity-nomograms-design of water mains-Hardy-cross method-applications.

Module – IV

Applications of membrane processes- Osmosis-Reverse Osmosis-Electrodialysis-Ultrafiltration- Ion Exchange-Adsorption- Breakthrough curves-Desalination techniques-treatment of hard waters.

References

1. Garg S. K., *Water Supply Engineering*, Khanna Publishers, 2012.
2. Punmia B. C., *Water Supply Engineering*, Laxmi Publications, 1995.
3. Steel E. W. and T. J. McGhee, *Water Supply and Sewarage*, McGraw Hill, 1991.
4. Modi P. N., *Water Supply Engineering*, Standard Book House, New Delhi, 1970.
5. Metcalf L. and H. P. Eddy, *Waste Water Engineering*, Tata McGraw Hill, 1984.
6. Peavy H. S., D. R. Rowe and G. Tchobanoglous, *Environmental Engineering*, McGraw Hill, 1985.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:

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

- *Analyze and understand main issues related to drinking water pollution and its management*
- *Explain, evaluate and design various units of a typical water treatment plant*
- *Outline the programmes, procedures for treatment and distribution of drinking water to community*
- *Develop an understanding on the advanced water treatment techniques*

13.503 STRUCTURAL ANALYSIS - II (C)

Teaching Scheme: 4(L) - 1(T) - 0(P) **Credits**: 5

Course Objectives:

To give an in depth idea regarding the analysis of indeterminate structures and also to give an idea about structural dynamics.

Module – I

Concept of static indeterminacy and their determination in beams, rigid-jointed frames and pin-jointed frames - Analysis of fixed beams by moment-area method – Effect of rotation and settlement of supports - Analysis of continuous beams by the theorem of three moments – Effect of settlement of supports.

Introduction to force method of analysis – Method of consistent deformation and its application to indeterminate beams, rigid-jointed plane frames, pin-jointed plane frames - Effect of lack of fit and temperature change in pin-jointed plane frames. Analysis of two-hinged arches.

Module – II

Müller-Breslau principle, Influence lines for statically indeterminate structures, Influence line diagrams for various force components in propped cantilever and two span continuous beams.

Concept of kinematic indeterminacy and their determination in beams, rigid-jointed frames and pin-jointed frames - Kinematically indeterminate beams – Introduction to displacement method of analysis – Slope- deflection method for beams and rigid jointed plane frames (with and without sway) – Effect of settlement of supports.

Module – III

Moment Distribution method for beams and rigid jointed plane frames (with and without sway) – Effect of support settlement – Kani's method for beams and rigid jointed plane frames of different geometry (with and without sway).

Module – IV

Introduction to Structural Dynamics – Dynamic systems and loads – D'Alembert's principle – Systems with single degree of freedom – Equation of motion - Free vibration and forced vibration – Undamped and damped free vibration – Logarithmic decrement – Response of single degree of freedom systems subjected to harmonic loading – Single degree of freedom systems subjected to support motion such as earthquake ground motion – formulation of equation of motion.

References:

1. Junnarkar S. B. and S. J. Shah, *Mechanics of Structures*-II, 23/e, Charotar Publishing House Pvt. Ltd., New Delhi, 2013.
2. Devdas Menon, *Advanced Structural Analysis*, Narosa Publishing House, New Delhi, 2013.
3. Reddy C. S., *Basic Structural Analysis*, Tata McGraw Hill, New Delhi, 1991.
4. Anand A. S., *Theory of Structures, Indeterminate Structural Analysis*, Sathyaprakasan, New Delhi, 2012.
5. Hibbeler R. C., *Structural Analysis*, Pearson Education, New Delhi, 2002.
6. Ghali A., A. M. Neville and T. G. Brown, *Structural Analysis – A Unified Classical and Matrix Approach*, CRC Press, 2003.
7. Rao D. S. P., *Structural Analysis – A Unified Approach*, Universities Press, 1996.
8. Mario Paz, *Structural Dynamics – Theory and Computation*, CBC Publishers, 1997.
9. Bhavikatti S. S., *Structural Analysis* – I&II, Vikas Publications House Pvt. Ltd, New Delhi, 2013.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

The students after undergoing this course will be able to analyse all types of structural systems.

13.504 GEOTECHNICAL ENGINEERING – I (C)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objective:

- *To impart to the students, the fundamentals of Soil Mechanics;*
- *To enable the students to acquire proper knowledge about the basic, index and engineering properties of soils.*

Module – I

Soil formation - Major soil deposits of India - Basic soil properties - Weight-volume relationships - Void ratio, porosity, degree of saturation, air content, percentage air voids, moisture content, specific gravity, bulk, saturated and submerged unit weights - Relationship between basic soil properties. Index properties - Sieve analysis – Well graded, poorly graded and gap graded soils - Stoke's law - Hydrometer analysis – Relative density – Consistency - Atterberg Limits - Practical Applications - I.S. classification of soils.

Module – II

Compaction of soils - Standard Proctor, Modified Proctor, I.S. light & Heavy Compaction Tests – OMC - Zero Air voids line - Control of compaction - Field methods of compaction [Brief discussion only]. Permeability of soils - Darcy's law – Factors affecting permeability - Constant head and falling head permeability tests - Average permeability of stratified deposits . Principle of effective stress - Total , neutral and effective stress variation diagrams - Quick sand condition - Critical hydraulic gradient - Estimation of quantity of seepage using flow nets[only for the case of seepage around a single row of sheet piles] – Definition of phreatic line and exit gradient.

Module – III

Compressibility and Consolidation - Void ratio versus pressure relationship - Coefficient of compressibility and volume compressibility – Compression index - Change in void ratio method - Height of solids method - Normally consolidated, under consolidated and over consolidated states - Estimation of pre consolidation pressure - Estimation of magnitude of settlement of normally consolidated clays – Terzaghi's theory of one-dimensional consolidation(no derivation required) - average degree of consolidation – Time factor - Coefficient of consolidation - Square root of time and logarithm of time fitting methods.

Module – IV

Shear strength of soils- Mohr-Coulomb failure criterion - Direct shear test, tri-axial compression test, vane shear test, unconfined compression test - Applicability - UU and CD

tests [Brief discussion only] - Sensitivity - Thixotropy - Liquefaction - Critical void ratio Stability of finite slopes - Toe failure, base failure, slip failure - Swedish Circle Method – Friction circle method – Factor of safety with respect to cohesion and angle of internal friction - Stability number - Stability charts - Methods to improve slope stability.

References:

1. Ranjan G. and A. S. R. Rao, *Basic and Applied Soil Mechanics*, New Age International, 2002.
2. Arora K. R., *Geotechnical Engineering*, Standard Publishers, 2006.
3. Venkataramaiah, *Geotechnical Engineering*, Universities Press, 2000.
4. Terzaghi K. and R. B. Peck, *Soil Mechanics in Engineering Practice*, John Wiley, 1967.
5. Taylor D.W., *Fundamentals of Soil Mechanics*, Asia Publishing House, 1948.
6. Das B. M., *Principles of Geotechnical Engineering*, Cengage Learning, Delhi, 2010.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Note: *Use of Taylor's stability chart is permitted in the Examination hall. Any other relevant data, if necessary, shall be given along with the question paper by the question paper setter.*

Course Outcome:

The students understand the basic principles governing soil behaviour; they understand the procedure, applicability and limitations of various soil testing methods.

13.505 TRANSPORTATION ENGINEERING - I (C)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

- *To impart knowledge in planning and design of railway tracks, rails, sleepers, points and crossings, track junctions, signals, control systems, stations and yards.*
- *To make the students aware of features and planning of harbour and harbour structures.*

Module – I

Introduction-Classification of transport modes-Role of Indian railways in the National development-Railways for Urban transportation-Light Rail Transit (LRT) and Mass Rapid Transit(MRT) system.

Railway track-Alignment-Requirement of good alignment-Factors in selection of good alignment.-Requirements of an ideal permanent way-Capacity of a railway track-Guages in a railway track- Selection –Uniformity of gauges-Railway track cross-sections-Coning of wheels.

Rails-Functions-Requirements - Type of rail sections - Length of rails - Rail joints - Welding of rails - Advantages. Defects in rails-Remedial measures-Wear on rails-Failure of rails - Creep of rails.

Rail fixtures and fasteners - Purpose and types - Modern elastic fastenings.

Sleepers-Functions-Requirements-Types-Sleeper density.

Ballast - Functions-Requirements-Types - Ballastless tracks.

Module – II

Geometric design of tracks-Necessity-Gradients-Grade Compensation on Curves-Radius and degree of a curve-Superelevation-Cant deficiency-Equilibrium speed-Safe speed on curves-Negative Superelevation-Necessity of providing transition curve-Length of transition curve-Widening of gauges on curves

Traction and tractive resistances-Comparison of tractions-Tractive resistances-Train resistances-Resistances due to track profile--Resistances due to starting and acceleration-Wind Resistance-Hauling capacity of a locomotive-Tractive effort of a locomotive-Problems.

Module – III

Points and Crossings-Necessity-Left and Right hand Turnouts-Switches-Types-Crossings Design of turnouts

Track junctions-Types. **-**Design of crossovers between parallel tracks-Design of diamond crossing.

Signalling - Objectives-Classification and characteristics.

Control systems of train movement-ATC, CTC only-Track Circuiting**-**Interlocking of signals and points-Necessity

Stations and yards-Layout of railway stations and yard, platforms, loops, sidings-passenger yards-level crossings.

Modern trends in railways-Modernisation of traction, track, trends in track vehicles(general awareness only).

Module – IV

Harbours-Classification-Requirements of Commercial harbour-Typical layout with general features-Factors controlling harbour size-Location and width of entrance-Stevensons formula for entrance width-Depth of harbour and approach channel-Shape of harbour

Meteorological phenomena -Wind, tides, Waves - wave parameters – fetch - Characteristics of wave-Stevensons formula-wave action-Coastal currents-Littoral drift.

Breakwater -Classification-Methods of construction-Methods of protection-Forces acting on wall type breakwater

Marine facilities - Wharf, pier, fenders, dolphins, aprons, transit shed, warehouse, Docks-Wet dock, Dry dock - Fixed and floating, lock gates.

Containerisation-Advantages-Planning of Container terminal.

Navigational Aids-Beacons-Buoys-Lighthouse-Lightships.

Moorings-Offshore moorings.

Dredging-Types-Choice of dredger

References:

1. Mundrey J. S., *Railway Track Engineering*, Tata McGraw Hill, 2010.
2. Saxena S.C. and S. Arora, *A Course in Railway Engineering*, Dhanpat Rai and Sons, 1998.
3. Quinn A.D., *Design and Construction of Ports and Marine Structures*, Tata McGraw Hill, 1978.
4. Oza H. P. and G. H. Oza, *A course in Dock and Harbour Engineering*, Charotar Publishing House, 1976.
5. Srinivasan R., *Harbour, Dock and Tunnel Engineering*, Charotar Publishing House, 2009.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Note: *No charts, tables, codes are permitted in the Examination hall. If necessary, relevant data shall be given along with the question paper by the question paper setter.*

Course Outcome:

- *After successful completion of the course, the students will possess knowledge on features of railway and harbour structures and shall be confident to take up the planning and design of various infrastructure components of railway and harbour structures.*

13.506 WATER RESOURCES ENGINEERING (C)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objective:

- *To give an idea regarding the availability of water on earth from various sources.*
- *To study the path of a drop of water as it starts from cloud and reaches the agricultural ields.*

Module – I

Hydrology-Hydrologic cycle - Precipitation types, forms, measurements-Computation of mean precipitation- -rain gauge density and optimum number of rain gauges-water losses-Infiltration-measurement by double ring infiltrometer- Horton's equation- infiltration indices.

Evaporation,-measurement by IMD Land pan. Runoff- Computation of runoff by different methods. Hydrograph (Sherman), Unit hydrograph and its applications-S- hydrograph.

Module – II

Planning of irrigation schemes-types of irrigation-lift and flow irrigation-Mode of irrigation water application-duty of water-soil water plant relationships-consumptive use (methods of estimation not required).-depth and frequency of irrigation water application-irrigation efficiencies.

Irrigation canals-types-canal alignment- Typical cross sections of unlined canals-Balancing depth. Design of canals on alluvial soils based on Kennedy's theory and Lacey's silt theory-canal lining-design of lined canals-Economics of canal lining.

Module – III

Groundwater –vertical distribution of groundwater-Types of aquifer-Aquifer properties-Darcy's law-Steady radial flow to a well-unconfined and confined aquifers-Types of wells-open well, artesian well and tube well-Estimation of yield of an open well-Pumping test and recuperation tests-Types of tube wells (only description, no design).

Module – IV

River Engineering-meandering-river training –objectives, classification, river training methods-levees, guide banks, groynes, artificial cut-offs, pitching, pitched islands (Design not necessary).

Stream flow measurement- velocity measurements-Computation of discharge (Area-velocity method)-rating curve (stage-discharge curve).

Reservoir-various types-zones of storage-storage capacity and yield-analytical and mass curve method-reservoir sedimentation-control of sedimentation-useful life of reservoir.-computation.

References:

1. Biswas A. K., *Water resources: Environmental Planning and Development*, Tata Mc Graw Hill, 1997.
2. Punmia B. C. and B. B. Pande, *Irrigation and Water Power Engineering*, Laxmi Publications, 2009.
3. Subramanya K., *Engineering Hydrology*, Tata McGraw Hill, 2013.
4. Modi P. N. and S. M. Seth, *Irrigation Engineering*, S.B.H Publishers and Distributors, 2002.
5. Ven Te Chow, *Hand book of Applied Hydrology*, Tata McGraw Hill, 1988.
6. Reddy P. J., *A Text Book of Hydrology*, Laxmi Publications. 2005.
7. Garg S. K., *Hydrology and Water Resources*, Khanna Publishers. 2000.
8. Todd D. K., *Ground Water Hydrology*, Wiley, 1995.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

Students become able to analyse and interpret hydrological data. They get an idea regarding the occurrence distribution and disposal of water on earth's surface.

13.507 PRACTICAL SURVEYING - II (C)

Teaching Scheme: 0(L) - 0(T) - 2(P) **Credits**: 2

Course Objective :

- *To equip the students to undertake survey using tacheometer*
- *To equip the students to undertake survey using total station*
- *To impart awareness on distomat and handheld GPS*

List of Exercises:

PART A

1. Tangential and Stadia Tacheometry - 4 classes
2. Three Point Problem (using Theodolite) - 1 class
3. Total Station survey - 5 classes
   - i. Heights and Distance
   - ii Calculation of area
   - iii. Verticality of tower

PART B

4. Setting out of Simple Curve - 1 class
5. Distomat – Measurement of distance - 1 class
6. Survey using Handheld GPS - 1 class

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

Questions based on the list of experiments prescribed in Part A.

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

After successful completion of the course, the students will be able to undertake survey using theodolite and shall be able to use modern survey minstruments.

13. 508 CONCRETE LABORATORY (C)

Teaching Scheme: 0(L) - 0(T) - 2(P) **Credits**: 2

Course Objective :

- *Getting practical knowledge in testing of construction materials*
- *Create awareness of the standards, specification and methods of testing of construction materials.*
- *Acquire practical experience in Concrete construction and quality control of construction materials.*

Pre requisites :

Basic Knowledge of 1) Building Technology (13.106)

2) Concrete Technology & Advanced Construction (13.304)

List of Experiments:

1. **Tests on cement**
    a) Standard consistency of cement
    b) Initial and final setting time of cement
    c) Compressive strength of cement mortar
    d) Fineness of cement
2. **Tests on aggregates (Fine aggregate & coarse aggregate)**
    a) Particle size distribution and grading
    b) Fineness modulus, bulk density, void ratio and porosity
    c) Bulking of fine aggregate
    d) Specific gravity of aggregate
3. **Tests on fresh concrete**
    a) Slump test
    b) Compacting factor test
    c) Vee- bee test (Demonstration only)
    d) Flow test (Demonstration only)
4. **Tests on hardened concrete**
    a) Compressive strength of concrete
    b) Modulus of elasticity of concrete
    c) Flexural and split tensile strength of concrete
    d) Rebound hammer test (To be conducted on 150mm cubes)

5. **Tests on bricks, blocks and tiles**
    a) Compressive strength of burnt bricks
    b) Water absorption tests on bricks
    c) Transverse strength test on tiles (M P tiles and mosaic tiles)
    d) Compressive strength of Solid/hollow blocks (Demonstration only)

Note: *The relevant IS Codes on methods of testing should be adopted for the above tests.*

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

Questions based on the list of experiments prescribed.

80% - Theory, Procedure and tabular column (30%);

Conducting experiment, Observation, Tabulation with Sample calculation (30%)

Graphs, Results and inference (20%)

20% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

- *The students will become capable of supervising general concrete construction works.*
- *The understanding of quality control methods to be adopted in the construction site and capability of ensuring required standards will be acquired.*