



# **ITM UNIVERSITY**

## **Naya Raipur, Raipur**

**B.Tech (Bachelor of Technology)**

**Third Year Engineering Syllabus**

**Fifth Semester**



**Department of Civil Engineering**  
**2017**



**Civil Engineering Branch**  
**B.Tech Fifth Semester Syllabus**  
**Teaching and Examination Scheme**

Subject Code	Subject Name	Teaching Scheme		Examination Scheme				
		Th.+Tut (L+T)	Pr. (P)	Theory Marks		Term Work (Internal)	Practical (External)	Total
				End Sem. Exam	Internal Assessment			
301501	Advanced Engineering Mathematics	06	-	70	30	-	-	100
301502	Geotechnical Engineering-II	04	-	70	30	-	-	100
301503	Transportation Engineering - I	04	-	70	30	-	-	100
301504	Civil Engineering Drawing	04	-	70	30	-	-	100
301505	Environmental Engineering – I	04	-	70	30	-	-	100
301506	R.C.C. Structures	04	-	70	30	-	-	100
301507	Transportation Engineering – I Lab.	-	02	-	-	15	35	50
301508	Civil Engineering Drawing Lab.	-	02	-	-	15	35	50
301509	Environmental Engineering – I Lab.	-	02	-	-	15	35	50
301510	R.C.C. Structures Lab.	-	02	-	-	15	35	50
301511	Vocational Training - I	-	02	-	-	15	35	50
301512	Project - III	-	04	-	-	50	100	150
		26	14	420	180	125	275	1000





**Subject Code: 301501**

**Lectures: 6 Hrs/Week**

**Subject Name: Advanced Engineering Mathematics**

**Theory Exam Duration: 3 Hrs**

**Detailed Syllabus**

<b>Topics</b>
<b>Unit -I: Mathematical Logic And Fuzzy Logic: Mathematical Logic:</b> Basic concept of mathematical logic, statements, connectives, logical equivalence, tautology, contradiction, Predicates and Quantifiers. <b>Fuzzy Logic:</b> Introduction to fuzzy sets, Operations on fuzzy sets, Fuzzy proposition, Fuzzy Quantifiers, Fuzzy Arithmetic, Fuzzy Relations, and Engineering Application.
<b>Unit -II : Graph Theory And Set Theory: Graph Theory:</b> Introduction to graph theory, path, circuit, wheel, planar and non-planar graph, Tree and rooted tree, Spanning tree, Shortest path algorithm(Dijkstra's algorithm, travelling salesman), Tree traversal, regular and bipartite graph. <b>Set Theory :</b> Sets, Functions, Relation, Group, Pigeonhole Principle, Inclusion – Exclusion Principle, Equivalence and partial ordering.
<b>Unit -III: Probability And Combinatory: Probability:</b> Definition of probability and sampling theorem, Conditional probability, Mean, Median, Mode and Standard Deviation. <b>Combinatory:</b> Permutation, combinations, Counting, Summation, generating function, recurrence relations, asymptotics.
<b>Unit -IV : Application Of Partial Differential Equations:</b> separation of variables; solutions of one dimensional diffusion equation; first and second order one-dimensional wave equation and two-dimensional Laplace equation
<b>Unit -V : Vector Calculus:</b> Vector operators, Directional derivative, Gradient, divergence and curl, Line, Surface and volume integral, Green's, Gauss's and stoke theorem and a applications.

**Recommended Books:**

1. A Text Book of Discrete Mathematics, Swapan Kumar Sarkar, S. Chand & Company Ltd.
2. Graph theory with applications to engineering and computer science, by Narsingh Deo, Prentice Hall of India.
3. Fuzzy sets and Fuzzy logic – George J. Klir and Bo Yuan – PHI learning Private Limited.
4. Engineering mathematics- H.K.Das – S. Chand and Company Ltd.
5. Vector Calculus – Thomas H. Barr – Second Edition.



**Subject Code: 301502**  
**Lectures: 4 Hrs/Week**

**Subject Name: Geotechnical Engineering - II**  
**Theory Exam Duration: 3 Hrs**

**Detailed Syllabus**

Topics
<b>Unit – I : GEOTECHNICAL EXPLORATION :</b> Importance and objectives of field exploration , principal methods of subsurface exploration , open pits & shafts , types of boring , number , location and depth of boring for different structures , type of soil samples & samplers. Principles of design of samplers , collection & shipment of samples , boring and sampling record. Standard penetration test, corrections to N –values & correlation for obtaining design soil parameters.
<b>Unit – II : STABILITY OF SLOPES :</b> Causes and types of slope failure , stability analysis of infinite slopes and finite slopes , $\phi$ center of critical slip circle , slices method for homogenous c- $\phi$ soil slopes with pore pressure consideration. Taylors stability numbers & stability charts , methods of improving stability of slopes , types, selection and design of graded filters.
<b>Unit-III: LATERAL EARTH PRESSURE:</b> Earth pressure at rest , active & passive pressure , General & local states of plastic equilibrium in soil. Rankines and Coulomb’s theories for earth pressure. Effects of surcharge submergence. Rebhann’s criteria for active earth pressure. Graphical construction by Poncelet and Culman for simple cases of wall-soil system for active pressure condition.
<b>Unit –IV: SHALLOW FOUNDATIONS: Bearing capacity of soils :</b> Terzaghi’s theory , its validity and limitations , bearing capacity factors, types of shear failure in foundation soil , effect of water table on bearing capacity factors, types of shear failure in foundation soil, effect of water table on bearing capacity , correction factors for shape and depth of footings. Bearing capacity estimation from N-value, factors affecting bearing capacity, presumptive bearing capacity. <b>Settlement of shallow foundation:</b> causes of settlement, elastic and consolidation settlement , differential settlement , control of excessive settlement, Proportioning the footing for equal settlement, Plate load test : Procedure, interpretation for bearing capacity and settlement prediction.
<b>Unit –V: DEEP FOUNDATIONS: Settlement of deep foundation:</b> causes of settlement, elastic and consolidation settlement, differential settlement, control of excessive settlement, Proportioning the footing for equal settlement, Plate load test : Procedure, interpretation for bearing capacity and settlement prediction. <b>Ground Improvement:</b> Method of soil stabilization use of admixtures (lime, cement, fly-ash ) in stabilization. Basic concepts of reinforced earth , use of geosynthetic materials Salient features , function and applications of various geosynthetic materials. Vibroflotation, sand darin installation, pre-loading.

**Recommended Books:**

1. Soil Mechanics and Foundation Engineering – B.C. Punmia (Laxmi Publication)
2. Soil Engineering in Theory and Practice (Vol-II) – Alam Singh (Asia Publishing House, New Delhi)
3. Soil Mechanics and Foundation Engineering – S.N. Murthy (Dhanpat Rai Publications)
4. Basic and Applied Soil Mechanics – Gopal Ranjan & Rao A.S.R. (New Age International, New Delhi, 1998)
5. Design Aids in Soil Mechanics and Foundation Engineering – S.R. Kaniraj (Tata McGraw Hill, New Delhi)
6. Geotechnical Engineering Principles and Practice – Donald P. Coduto (Prentice Hall of India, New Delhi)
7. Soil Mechanics and Foundation Engineering – Garg S.K. (Khanna Publishers)
8. Arora K.R. : Soil Mechanics & Foundation Engineering.
9. Punmia B. C. : Soil Mechanics & Foundations
10. Gopal Ranjan & Rao : Basic & Applied Soil Mechanics

**Subject Code: 301503**

**Lectures: 4 Hrs/Week**

**Subject Name: Transportation Engineering - I**

**Theory Exam Duration: 3 Hrs**

**Detailed Syllabus**

<b>Topics</b>
<p><b>Unit- I Principal Of Highway Planning :</b> Road transport Characteristic, Classification of roads, development plan, network patterns, data collection and surveys, principles of alignment, Road development and planning in India Highway alignment, requirements. Engineering Surveys for highway location Maps and Drawing. Geometric Design: Cross Section elements of horizontal and vertical Alignment. Highway drainage, Surface and subsoil drainage.</p>
<p><b>Unit-II Traffic Engineering :</b>Traffic characteristics, studies such as volume Speed. 'O' and 'D' parking etc. and their uses. Traffic control devices, Prevention of road accidents, rotary intersection, highway lighting, Devices-marking, Sign, Signals, Regulation Motor Vehicle Act and rule. Pavement Design : Types of pavement &amp; Characteristic, Design parameters, Axle &amp; Wheel load, tyre pressure, ESWL for dual Wheels, repetitions, Group Index &amp; CBR method of flexible pavement design. Analysis of load &amp; temperature stresses of rigid pavement, Joints.</p>
<p><b>Unit-III Materials Sub grade Soil :</b> AASHO Classification, group Index, Sub grade soil Stabilization, Behaviour of highway materials, properties of Sub grade and pavement component materials. Tests on sub grade soil, Aggregate and bituminous materials. Drainage, shoulders, road - oriculture maintenance &amp; repairs, Choice of construction.</p>
<p><b>Unit- IV Bridges :</b> General: Components, classification and Identification, Data Collection site selection. Economic Span. Loads , Forces , Stresses : IRC Specification &amp; code of practices, critical combinations. Sub- Structure : Types of foundations &amp; their choice, Abutment, piers &amp; Wing walls Their types general design principles. Rating and Maintenance : Methods &amp; Techniques of rating of existing bridges Inspection, Repairs, maintenance, corrosion- causes and prevention, Aesthetics.</p>
<p><b>Unit –V Airport Planning :</b> Definition of terms related to airport engineering, factors affecting site, selection, obstructions, various surveys for site selection, zoning laws. Classification of Obstructions. Runways: Orientation, Basic runway length and its corrections. Geometric design, runway configuration taxiways layout geometric, Standards, exit taxiways fillets separation.</p>

**Recommended Books:**

1. Principle and Practices of Highway Engineering – Kadiyali & Lab (Khanna Publishers, Delhi)
2. Highway Engineering: Khanna and Justo. Nem Chand
3. Bridge Engineering by S. P. Bindra. Dhanpat Rai Publication
4. Bridge Engineering by S. C. Rangwala. Charotar Publishing House Pvt.Limited
5. Principles of pavement Design – Yoder and witzak
6. Air-port planning and Design – Khanna and Arora (Khanna Publishers, Delhi)
7. Highway Engineering – Rangawala S.C. (Charotar Publishers)
8. Specifications for Road and Bridge Works – MOST (IRC Publishers)
9. Manual for Survey, Investigation and Preparation of Road Projects – IRC Publication 2001.
10. Pavement Design: Yoder and Witzak Wiley
11. Traffic Engineering: L.R.Kadiyali Khanna Publishers

**Subject Code: 301504**  
**Lectures: 4 Hrs/Week**

**Subject Name: Civil Engineering Drawing**  
**Theory Exam Duration: 4 Hrs**

**Detailed Syllabus**

Topics
<p><b>UNIT-I : Drawing of Building Elements</b> -Drawing of various elements of buildings like various types of footing , open foundation, raft, grillage, pile and well foundation, Drawing of frames of doors , window, various types of door, window and ventilator, lintels &amp; arches, stairs &amp; staircase trusses, flooring, roofs etc</p>
<p><b>UNIT-II: Building Planning</b> – Provisions of National Building Code, Building bye-laws, open area, setbacks, FAR terminology, principle of architectural composition (i.e. unity, contrast, etc.), principles of planning, orientation.</p>
<p><b>UNIT-III : Building Services</b> –Introduction of Building Services like water supply &amp; drainage, electrification, ventilation and lightening and staircases, fire safety, thermal insulation, acoustics of buildings.</p>
<p><b>UNIT-IV : Design and Drawing of Building</b> – Design &amp; preparation of detailed drawings of various types of buildings like residential building, institutional buildings &amp; commercial buildings detailing of doors, windows, ventilators and staircases etc.</p>
<p><b>UNIT-V: Perspective Drawing</b> – Elements of perspective drawing involving simple problems, one point and two point perspectives, energy efficient buildings.</p>

**Recommended Books:**

1. Malik &Meo; Building Design and Drawing By
2. Shah, Kale &Patki; Building Design and Drawing; TMH
3. Gurucharan Singh &Jgdish Singh Building Planning, Design and Scheduling

**Subject Code: 301505**
**Lectures: 4 Hrs/Week**
**Subject Name: Environmental Engineering – I**
**Theory Exam Duration: 3 Hrs**
**Detailed Syllabus**

Topics
<p><b>Unit – I: Introduction:</b> Importance and necessity of water supply scheme. Water Demand: All types of water demand, empirical formulae, factors affecting per capita demand, variation in demand, design period, population forecasting methods and examples. Intake structures: Location, Types River, lake, canal, reservoir etc.</p>
<p><b>Unit – II: Conveyance Of Water:</b> Types of pipes, joints, fittings, valves &amp; appurtenances. Hydraulic design aspects: Friction, Manning's, Darcy Weishbach &amp; Hazen Williams equation and problem Rising main and pumps: Concept of rising main, Classification, working, merits and demerits, selection of pumps.</p>
<p><b>Unit – III : Water Quality:</b> Physical, Chemical and bacteriological characteristics of water, Health effects of various water characteristics, Standards of drinking water. (WHO 2011, CPHEEO, IS10500). Water born diseases. Water treatment: Objective of treatment, unit operations and processes, house hold &amp; community based rural water treatment, flow sheet of conventional water treatment plant. Coagulation and Flocculation: Definition, Principles, types of coagulants, coagulant doses, types of mixing and flocculation devices.</p>
<p><b>Unit – IV: Aeration:</b> Purpose, types of aerators, design of cascade aerator. Sedimentation: Principles, types of setting basins, inlet and outlet arrangements, simple design of sedimentation tank. Clari-flocculators: Principles and operation. Filtration: Mechanism of filtration, types of filters-RSF, SSF, Pressure filters, elements of filters sand specification.</p>
<p><b>Unit – V : Disinfection:</b> Purpose, Mechanism, criteria for good disinfectant, various disinfectants, their characteristics, disinfection by chlorination using different forms of chlorine. Types of chlorination. Distribution systems: Requirements of a good distribution system, methods of distribution systems and layouts. Storage reservoirs for treated water: Types, capacity of reservoir.</p>

**Recommended Books:**

1. Water Supply Engineering – S.K. Garg (Khanna Publication).
2. Water Supply Engineering – B.C. Punmia (Laxmi Publication, New Delhi)
3. Environmental Engineering – Peavy & Rowe (Tata McGraw Hill, New Delhi).
4. Water Supply and Sanitary Engineering – G.S. Birdi (Dhanpat Rai Publications).
5. Introduction to Environmental Science – Y. Anjaneyulu (B.S. Publications)
6. Environmental Science and Engineering – Henry and Heinke (Pearson Education)



**Subject Code: 301506**  
**Practical: 4 Hrs/Week**

**Subject Name: R.C.C. Structures**  
**Theory Exam Duration: 3 Hrs**

### Detailed Syllabus

Topics
<p><b>UNIT I : Introduction To The Working Stress Method Of Rcc Design</b> .Basic concept in design for flexure , assumptions, design constants. Analysis of the rectangular section. Balanced, under reinforced and over –reinforced sections. Drawback &amp; limitations of Working Stress method. Prestressed Concrete: Properties of high grade materials, concepts of prestressed concrete, method of prestressing , losses in prestressing. Various systems for prestressing.</p>
<p><b>UNIT II: Introduction To Limit State Design:</b> Concept of probabilistic design and limit state design. Characteristic values, partial safety factors, stress strain relationship Failure criteria, types and properties of reinforcement, limit state of Serviceability and limit state of collapse. Review of IS-456 – 2000. Limit state of collapse in flexure: Analysis and design of singly reinforced rectangular section. Balanced failure mode, primary tension failure mode and primary compression failure mode.</p>
<p><b>UNIT III: Limit State Of Collapse In Flexure:</b> Analysis &amp; design of the Tee &amp; L-beam section. Limit state of collapse in compression: Analysis &amp; design of short axially loaded column .Columns subjected to uniaxial bending, use of interaction curves.</p>
<p><b>UNIT IV: Design Of Circular Water Tank</b> with roof slab/ dome resting on ground by Approximate method / IS code method.</p>
<p><b>UNIT V: Design Of Prestressed Slab/ Rectangular Beam.</b> (With LSM) Design of one –way, simply supported, single span and cantilever slabs and continuous slab / beam with IS coefficients. Design of rectangular footing for axial load.</p>

#### Recommended Books:

1. George Vergese, Design of Reinforced Concrete Structures, Prentice Hall Publishers.
2. Punmia B.C., Jain A.K., Jain A.K, Reinforced Concrete Structures (Vol I), Standard publishers Distributor, Delhi
3. Sinha S.N, Reinforced Concrete Design, Tata McGraw Hill Publishing Company Limited, New Delhi

**Subject Code: 301507**  
**Practical: 2 Hrs/Week**

**Subject Name: Transportation Engineering – I Lab.**

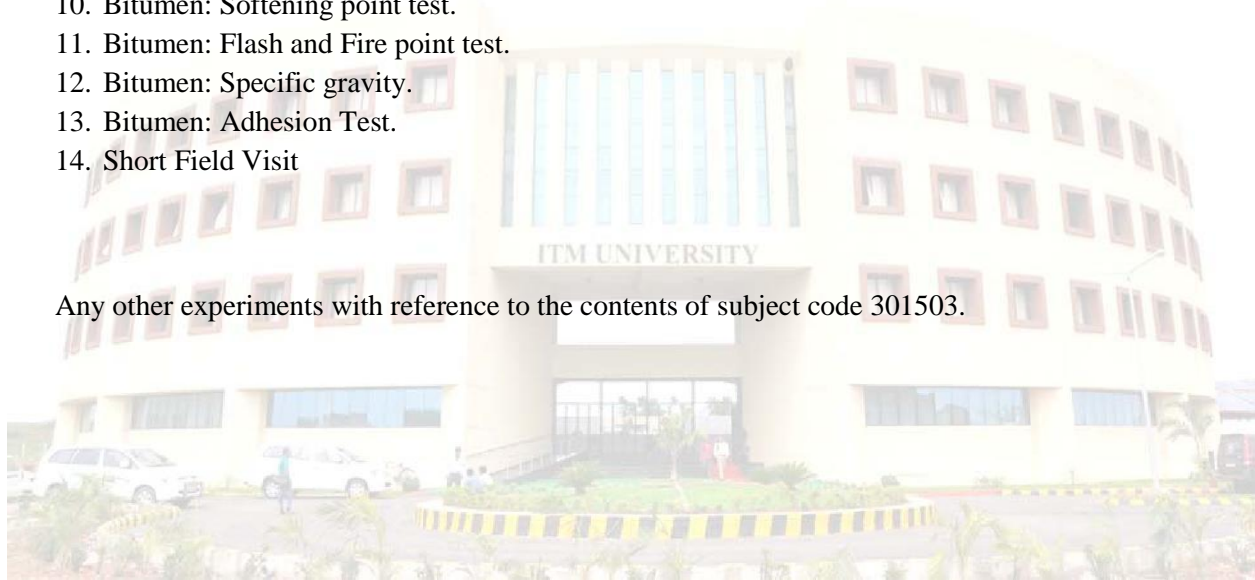
### **Detailed Syllabus**

**Term work:** Term work shall consist of record minimum ten experiments out of the following;

#### **LIST OF EXPERIMENTS**

1. Sub grade Soil: CBR test
2. Sub grade Soil: AASHO Classification
3. Aggregates: crushing value test.
4. Aggregates: Los Angeles abrasion value test.
5. Aggregates: impact test.
6. Aggregates: shape test.(Elongation Index, Flakiness index and Soundness test)
7. Aggregates: Specific Gravity and Water absorption test.
8. Bitumen: Penetration Value.
9. Bitumen: Ductility Test.
10. Bitumen: Softening point test.
11. Bitumen: Flash and Fire point test.
12. Bitumen: Specific gravity.
13. Bitumen: Adhesion Test.
14. Short Field Visit

Any other experiments with reference to the contents of subject code 301503.





**Subject Code: 301508**  
**Lectures: 2 Hrs/Week**

**Subject Name: Civil Engineering Drawing Lab.**

### **Detailed Syllabus**

**Term work:** Term work shall consist of record of the following;

#### **List of Experiments:**

1. Working drawing of residential single storied building of terrace and pitched roofs with foundation plan of load bearing structure. (Two assignment)
2. Submission drawing of single storied residential building (framed structure) with access to terrace including all details and statements as per the local bye-laws. (One assignment A1 sheet)
3. Working drawing of multistoried Public / Educational / Health / Community / Industrial building including structural details and layout of services. (One assignment).
4. Two point perspective of the single Residential building neglecting small building elements. (Two assignment – pitched & terraced roof)
5. Minimum 30 free hand self-explanatory dimensioned sketches of various building elements in sketchbook.
6. Line plans of various types of buildings e.g. public / educational / industrial / hospital / community on graph papers (04 assignments)
7. Submission drawing of 02 storied residential building framed structure including all details and statements as per the local bye laws.
8. One compulsory field exercise.
9. Sketches of various building components.
10. One drawing sheet of various building components containing doors, windows ventilators, lintels and arches stairs foundations etc.
11. One drawing sheets each for services and interiors of buildings.
12. One drawing sheet containing detailed planning of one/two bed room residential building
13. One drawing sheet each of residential and institutional building
14. Use of AutoCAD for preparation of drawings

Any other experiments with reference to the contents of subject code 301404.

**Subject Code: 301509**  
**Practical: 2 Hrs/Week**

**Subject Name: Environmental Engineering – I Lab.**

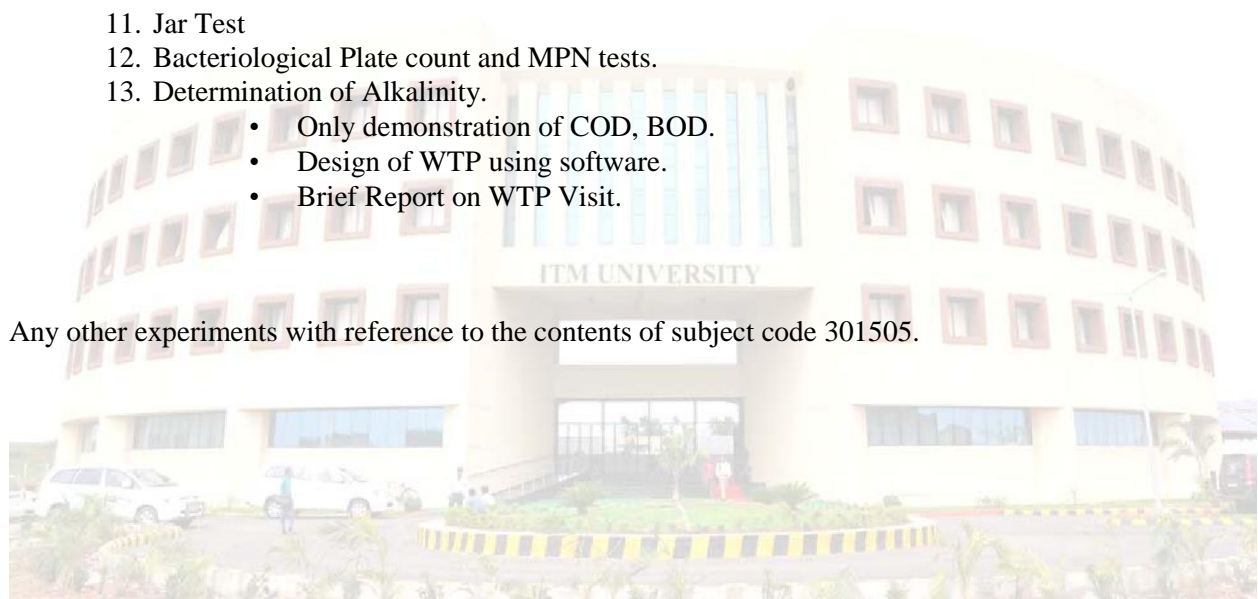
### **Detailed Syllabus**

**Term work:** Term work shall consist of record minimum ten experiments out of the following;

#### **List of Experiments**

1. Determination of pH
2. Determination of Conductivity
3. Determination Chlorides
4. Determination of Solid's (Suspended & dissolved)
5. Determination of Turbidity
6. Determination of Acidity
7. Determination of Dissolved Oxygen
8. Determination of Membrane filtration technique.
9. Determination of Available Chlorine
10. Determination of Residual Chlorine
11. Jar Test
12. Bacteriological Plate count and MPN tests.
13. Determination of Alkalinity.
  - Only demonstration of COD, BOD.
  - Design of WTP using software.
  - Brief Report on WTP Visit.

Any other experiments with reference to the contents of subject code 301505.



**Subject Code: 301510**  
**Practical: 2 Hrs/Week**

**Subject Name: R.C.C. Structures Lab.**

### **Detailed Syllabus**

**Term work:** Term work shall consist of record of the experiments out of the following -:

#### **LIST OF EXPERIMENTS**

1. Circular water tank with roof slab/dome resting on ground.
2. Rectangular water tank with one –way roof slab resting on ground.
3. Single span prestressed concrete rectangular beam , slab.
4. One way slab, continuous slab.
5. Rectangular pad / slopped footing.
6. **One field visit and its report to be submitted / recorded in the journal / practical record book.**

Any other experiments with reference to the contents of subject code 301506.

**Subject Code: 301511**

**Subject Name: Vocational Training - I**

**Practical: 2 Hrs/Week**

### **Detailed Syllabus**

**Term work:** After Completion of Industrial Training each Group has to submit the Report file in a University Prescribed Format and followed by a Presentation and Viva Voice.

S.NO	Description
1	Report Writing
2	Objective of the Industrial Training
3	Working Methodology / Technology
4	Results and Discussion
5	Conclusion
6	Future Scope
7	Presentation Skills
8	Viva Voice
	Total- 50

Please Note: - Based on the above a power point presentation must be given by the candidate and defended with positive attitude



**Subject Code: 301512**  
**Practical: 4 Hrs/Week**

**Subject Name: Project - III**

**Term work:** Term work shall consist of report / thesis submitted based on the topic of one good Engineering / Research based problem.

1. **Formation of team, selection of topic :** Presentation on different project topics, Team formation including students and guide, Literature review in Library and internet on different project topics, Selection of Project topic and objectives
2. **Site Visits (If required):** Before undertaking the project design, team should visit sites where the project is already implemented and get acquainted with different perspectives. They should meet experienced personalities in the area and take their advice.
3. **Preliminary Design :** After selection of topic, the team should carry out further literature review and then come out with the preliminary design of the project in the form of drawing and explanation.
4. **Semester Project Progress Report :** A semester project progress report should be prepared comprising the work done as said above. The report should be presented before the Department faculty and subject experts.

The Report / Thesis must contain the following:-

1. Well-defined Case – based Problem
2. Motivation to select such problem
3. General approach to solve such problems
4. Methods Applied to Solve such Problems
5. Flowchart and Algorithm to solve Problem
6. Basic Software and Hardware required to solve such problem
7. Practical Applications
8. Final Observations and Conclusions
9. Any help to the Society through the above said Problem.

Please Note:- Based on the above work a power point presentation must be given by the candidate and defended with positive attitude. The candidate will be appreciated if he / she present his / her work in a Conference or publish his / her work in a reputed Journal